"EVEREADY" BATTERY APPLICATIONS AND ENGINEERING DATA

UNION CARBIDE

THE COVER

The nerve center of Union Carbide's far-flung operations is a 52-story building of stainless steel and glass at 270 Park Avenue in New York City. Here you will find the people who co-ordinate the Corporation's vast network of facilities throughout the world. The new Union Carbide Building is one of the tallest structures on Park Avenue's fast-growing row of corporate headquarters.

$4.95

"EVEREADY" BATTERY APPLICATIONS AND ENGINEERING DATA

Contents

PAGE

Foreword
How to Use the Data Book 7
Index – "Eveready" Battery Number to Page Number 9

LECLANCHÉ (Carbon Zinc) DRY BATTERIES

Description of Leclanché (Carbon-Zinc) Dry Batteries 15
Specification Listing – Leclanché (Carbon-Zinc) Dry Batteries 20
Terminal Sketches – Leclanché (Carbon-Zinc) Dry Batteries 30
Leclanché (Carbon-Zinc) Dry Battery Service Life Table 43
Leclanché (Carbon-Zinc) Dry Batteries – Active Types, Arranged by Ascending Voltage, and in Ascending Order of Service Capacity within the Voltage Category
- 1.5 Volts 45
- 3 Volts 91
- 4.5 Volts 93
- 6 Volts 111
- 7.5 Volts 133
- 9 Volts 141
- 12 Volts 165
- 13.5 Volts 171
- 15 Volts 173
- 22.5 Volts 183
- 30 Volts 197
- 33 Volts 213
- 45 Volts 215
- 67.5 Volts 233
- 75 Volts 241
- 90 Volts 243
- 225 Volts 249
- 240 Volts 251
- 300 Volts 253
- 510 Volts 255
- 1.5 – 90 Volts 257
- 7.5 – 9 – 90 Volts 259

Contents *(Continued)*

PAGE

ALKALINE BATTERIES

Description of Alkaline Primary Batteries....................265
Alkaline Primary Batteries............1.5 Volts....................269
6 Volts....................283
Description of Alkaline Secondary Batteries....................285
Alkaline Secondary Batteries........7.5 Volts....................289
15 Volts....................291
Description of Alkaline Transistor Radio Batteries....................293
Alkaline Radio Batteries................4.5 Volts....................295

NICKEL-CADMIUM BATTERIES

Description of Nickel-Cadmium Batteries....................299
Specification Listing—Nickel-Cadmium Batteries....................302

MERCURY BATTERIES

Description of Mercury Batteries....................333
Specification Listing—Mercury Batteries....................340
Mercury Batteries, Active Types, 1.35 & 1.40 Volts....................347
2.70 & 2.80 Volts....................413
4.05 & 4.20 Volts....................421
5.60 Volts....................431
7.00 Volts....................433
8.40 Volts....................435

SILVER BATTERIES

Description of Silver Batteries....................441
Silver Batteries....................1.5 Volts....................443

APPENDIX

Battery Cross Reference
of Comparative and Interchangeable Numbers............456
Bureau of Standards Publications
Specification for Dry Cells and Batteries
Electrical Characteristics of Dry Cells
and Batteries (Leclanché Type)

FOREWORD

Ever since it appeared on the first commercial dry cell in 1890, the trade-mark "Eveready" has been synonymous with superior *packaged power*. Indeed, "Eveready" performance supports the claim, "Power to Spare!"

With over 350 different batteries, "Eveready" has an answer to every power need. And there are engineers ready to help you choose the right electrochemical source from among these basic systems:

Carbon-Zinc *(Leclanché, Primary)*
Alkaline-Manganese
  Primary
  Rechargeable
Nickel-Cadmium *(Rechargeable)*
Mercury *(Primary)*
Silver *(Primary)*
And others

This reference manual contains the basic data on all "Eveready" batteries currently in production. For additional information, or for consultation, please contact the nearest Union Carbide sales office. (see list of offices on inside back cover.)

Digitized by the Internet Archive
in 2023 with funding from
Amateur Radio Digital Communications, Grant 151

https://archive.org/details/evereadybatterya00unse

How to Use the Data Book

The assembly and presentation of dry battery data are at best cumbersome because of the many variables involved. Complete data on dry battery characteristics would occupy several large file cabinets and therefore economy and convenience dictate a compromise.

Battery drain data in this book are generally organized in tabular form rather than curve or graph. This method provides maximum space economy and flexibility in data assembly. Some objections may be voiced concerning lack of voltage vs. time discharge curves. This method of layout provides little information in a given area and includes highly divergent data (very high and very low cut-offs) which are not reliable on a per cell basis and therefore of limited value to the reader.

The Table of Contents lists all major sections in this book. These are explained below:

Index—"Eveready" Battery Number to Page Number

Knowing the "Eveready" battery number, all data will be found on the page or pages listed. *The most active types are in bold face print and receive full page treatment.* Others are described only in the specification listing.

Specification Listing — Leclanché Batteries

All "Eveready" Leclanché batteries are arranged in ascending voltage categories starting with 1.5 volts. Within any voltage category batteries are arranged in ascending order of capacity. Dimensions, cell makeup, weight, terminal sketches and other pertinent data are listed. This section also contains a limited amount of service data organized by cell type. The service data shown in the table for each cell apply, usually, to a mix which is utilized in a general purpose battery. Other formulations may be used in any given cell size. In these instances the data in the table will still show the order of service life to be expected. In the full page treatment of active battery types the service life given applies specifically to each battery.

Active types are in boldface print

Full Page Specifications

All Batteries are arranged by system, i.e. Leclanché, Alkaline, Nickel-Cadmium, Mercury and Silver. Batteries within a system are arranged by voltage category, starting with single cell types. Batteries within a voltage category are arranged in order of ascending capacity. Data for Leclanché and Alkaline batteries are in tabular form involving a wide choice of (1) drains within thecapabilities of the cells (2) cut-off voltages (3) discharge schedules.

For drains not specifically listed standard interpolation procedures may be used with reasonable accuracy.

Alkaline Batteries

Alkaline cells and batteries are organized in the same manner as Leclanché types.

Nickel-Cadmium Batteries

Nickel-Cadmium cells and batteries are arranged in a specifications listing in order of increasing cell capacity. Subsequent battery curves, which give various charge and discharge characteristics, are arranged by cell type – button, cylindrical and rectangular – in order of increasing cell capacity.

Mercury Batteries

Mercury cells and batteries are organized in the same manner as Leclanché types.

Silver Batteries

Silver Batteries are organized in the same manner as Leclanché types.

Cross Reference

The complete line of "Eveready" batteries is cross referenced with the type numbers of other dry battery manufacturers as well as the NEDA (National Electronic Distributors Association) and military numbers.

Bureau of Standards Publications

These publications contain generalized information concerning standard testing procedures, cell sizes, effects of storage temperature, cell resistance and other items of interest to the battery user.

Index

THE MOST ACTIVE TYPES ARE IN BOLD FACE TYPE

"EVEREADY" BATTERY NUMBER	PAGE
E1	379
E1E	381
E1N	383
E3	387
E3E	389
E4	399
E4E	401
EPX-4	342
6 "Gray Label"	87
6 "Ignitor"	85
6 Railroad & Industrial	89
EPX-6	342
E9	395
E9N	397
E12	403
E12E	405
E12N	407
N22	302
N24	302
N26	302
N26T	302
N28	302
N28T	302
N32	302
N32T	302
N33	302
N33T	302
N36	302
N36T	302
N38	302
N38T	302
N39	302
N40	302
N40T	302
N41	302
N41T	302
S41	445
S41E	447
E42	409
E42N	411
N43	302
N43T	302
N45	302
N46	302
N52	302
N56	302
N67	304
N70	304
N73	302
N74	302
N75	304
N76	304
S76	449
S76E	451
N77	304
N79	304
N81	304
N83	304
N85	304
E90	269
E91	271
E93	275
E94	273
E95	277
E97S	281
D99	73
A100	75
E113	340
E114	342
E115N	342
E120E	340
E122E	340
E126	437
E132B	415
E132E	417
E132N	419
E133	423
E133E	425
E133N	427
E134N	342
E135N	342
E136N	342
E137N	342
E140E	385
E145	342
E146	435

"EVEREADY" BATTERY NUMBER	PAGE
E152E	413
E152N	340
E153N	340
E162	340
E163	421
E164	431
E165	433
E169	342
E175	342
E177	342
201	45
206	141
216	143
226	145
228	165
E233	429
E234	342
239	171
243	99
246	149
266	151
274	22
276	153
301	443
303	453
E312	340
E312E	347
333	93
E340E	47
W-350	24
W-351	24
W-352	22
W-353	20
W-354	20
W-356	22
W-357	22
W-358	24
W-359	24
W-361	26
W-362	22
W-363F	24
W-363P	24
W-364F	24
W-364P	24
W-365F	24
W-365P	24
W-366	26
W-367	28

"EVEREADY" BATTERY NUMBER	PAGE
W-368	28
W-369	26
W-371	22
E400E	349
E400N	351
E401	375
E401E	377
404E	24
405E	24
409	119
411	177
411E	179
412	187
412E	189
413	205
413E	207
415	215
416	233
417	181
420	191
425P	24
430	209
430P	211
433P	213
437	241
E450	363
E450E	365
455	219
455P	221
457	235
460	217
467	239
468	26
477	237
479	243
482	225
484	229
487	231
489	26
490	245
491	251
492	249
493	253
495	247
497	255
E502	391
E502E	393
504	173

"EVEREADY" BATTERY NUMBER	PAGE
504E	175
505	183
505E	185
506	197
506E	199
507	201
507E	203
509	113
510F	22
510S	115
515	20
520	283
E520E	353
523	295
560	289
561	291
E601	340
621	22
E625E	359
E625N	361
E630	367
E630E	369
635	67
E640	371
E640E	373
E675	355
E675E	357
702	22
703	95
704	22
706	129
707	137
708	195
713	22
714	103
715	139
716	161
717	135
718	22
720	20
724	22
726	101
727	28
729	26
731	127
735	81
736	105
738	223

"EVEREADY" BATTERY NUMBER	PAGE
740	20
741	20
742	83
743	20
744	117
746	107
750	91
751	22
752	28
752W	28
753	261
754	28
755	28
756	259
757	28
759	257
761T	22
762S	227
763	193
766T	24
771	22
773	133
776	28
778	24
781	97
785	28
789	22
799	26
815	53
835	63
850	69
904	49
912	51
915	55
935	65
950	71
960P	20
964	79
1015	57
1015E	59
1016	61
1016E	20
1050	77
1052P	20
1461	131
1462	22
1463	169
1562	22

"EVEREADY" BATTERY NUMBER	PAGE
1662	163
2314	24
2356	155
2506	22
2709	147
2713	111
2731	109
2744	121
2745	123
2746	125
2761	157
2762	159
2780	167
E302125	342
E302157	340
E302158	344
E302227	340
E302229	342
E302240	344
E302249	342
E302250	342
E302257	340
E302271	344
E302351	342
E302354	342
E302358	342
E302360	344
E302362	344
E302424	342
E302425	344
E302435	342
E302437	342
E302462	344

"EVEREADY" BATTERY NUMBER	PAGE
E302463	340
E302464	342
E302465	344
E302467	342
E302478	342
E302497	342
E302499	344
E302502	344
E302506	344
E302510	340
E302519	342
E302527	344
E302539	344
E302540	340
E302554	344
E302558	344
E302579	344
E302580	344
E302589	344
E302642	342
E302651	340
E302667	342
E302702	340
E302795	342
E302800	344
E302830	342
E302896	342
E302904	342
E302905	342
E302907	342
E302908	342
E303035	342

LECLANCHÉ
(CARBON ZINC)
DRY BATTERIES

Leclanché Dry Batteries (Carbon-Zinc)

The standard carbon-zinc dry battery is considered a primary type, i.e. not efficiently reversible. The basic cell is made in many shapes and sizes but two general categories exist:

1. Round cells – available as unit cells or in assembled batteries.
2. Flat cells – available in multi-cell batteries only.

The difference between the round and flat cells is mostly physical. The chemical ingredients are the same in both cases – carbon, depolarizing mix, separator, electrolyte and zinc. The "Mini-Max" flat cell utilizes these materials in a laminated structure while in the round cell they are arranged in a concentric fashion (see Figures 1 & 2)

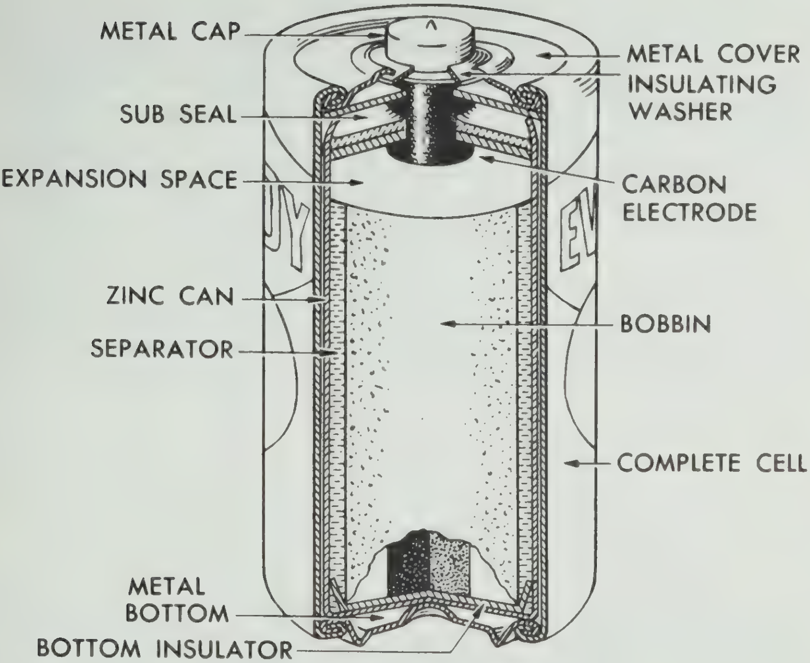


FIGURE 1 — CROSS SECTION OF ROUND CELL

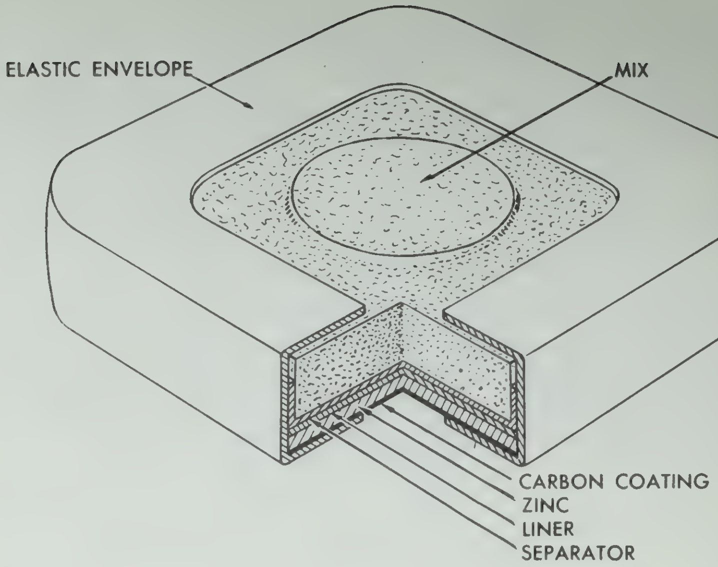


FIGURE 2 — CROSS SECTION OF "MINI-MAX" FLAT CELL

The "Mini-Max" cell contains no expansion chambers or carbon rod as does the round cell. This increases the amount of depolarizing mix available per unit cell volume and therefore the energy content. In addition the flat cell, because of its rectangular form, reduces waste space in assembled batteries. The energy to volume ratio of a battery utilizing round cells is inherently poor because of the voids occurring between cells. These two factors account for an energy to volume improvement of nearly 100% for "Mini-Max" cells compared to round cell assemblies.

Leakproofness is radically improved in "Mini-Max" battery construction. Zinc is chemically consumed during battery discharge. Since zinc is not used as a container in the "Mini-Max" cell, as it is in a round cell, leakage difficulties are for all practical purposes eliminated.

CATHODIC ENVELOPE CONSTRUCTION

The "Mini-Max" cell and most flat cell batteries utilize only one surface of the zinc anode for the electro-chemical reaction which produces energy. Recently Union Carbide Consumer Products Company developed a new construction which has a much higher energy-to-volume efficiency than that of any other carbon-zinc cells. This construction, known as cathodic envelope, is shown in Figure 3.

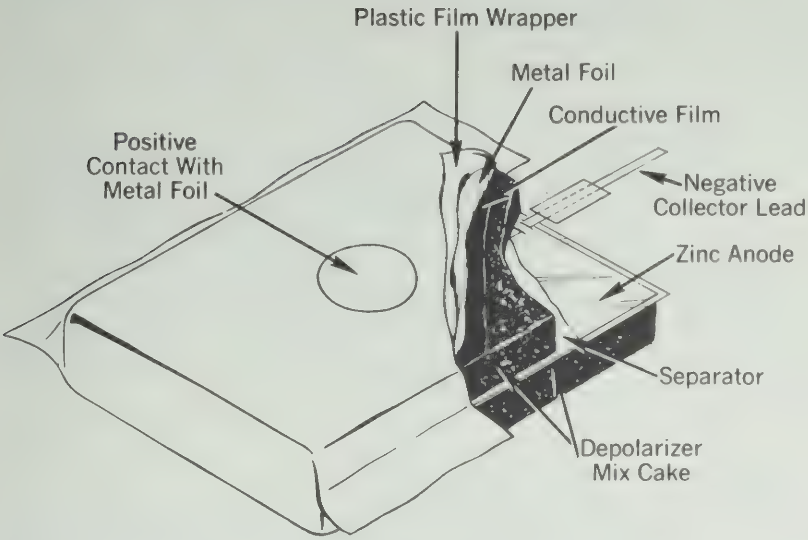


FIGURE 3 — CUTAWAY OF TYPICAL CATHODIC ENVELOPE CELL

The additional service obtained from the cathodic envelope construction stems in part from the greater amount of energy-producing materials which can be packed into a given volume. Increased anode surface area also enhances the service by making possible greater operating efficiencies at the current drains required from batteries in transistorized equipment.

Instead of using a laminated structure of zinc anode plates and cathode cakes, found in conventional flat-cell batteries, the cathodic envelope construction surrounds the zinc plate anode with the cathode material in the form of two flat cakes of depolarizer mix. This doubles the effective zinc anode area and thus reduces the current density in the chemical mix. A much higher electro-chemical efficiency is therefore attainable with heavy current drains.

Encasing this anode sandwich, and bonded to a plastic envelope sealing the cell, is the cathode collector, a special carbon-impregnated, current conducting film of flexible plastic and metal foil.

The cathodic envelope type of construction permits the manufacture of a variety of battery shapes and sizes to suit a wide range of applications in transistorized equipment.

Efficiency

The chemical efficiency of a dry cell improves as the current density decreases. This points up an important applications principle: Use as large a battery as is possible consistent with physical limitations. Over a certain range of current density, service life may be tripled by halving the current drain. This is equivalent to using a larger battery for a given application and therefore reducing current density within the cells. For very small drains shelf life becomes important; and the choice of too large a battery would mean excessive loss of energy through shelf deterioration rather than use.

Shelf Life and Temperature Limitations

Shelf life is defined as the period of time (measured from date of manufacture) after which a given battery still retains a specified percentage (usually 90%) of its original energy content. The storage temperature is considered to be 70°F.

Shelf deterioration is due to:

1. Moisture loss in the cell through evaporation.
2. Low level chemical reactions occurring within the cell independent of those due to current drains.

As is true with most chemical reactions, elevated temperatures hasten wasteful zinc corrosion and other side chemical reactions within the cell while lower temperatures moderate them. It is obvious that a storage temperature must be stated when defining shelf life.

In view of the above, it is important that exposure of dry batteries to high ambient temperatures be avoided. Temperatures in excess of 125°F will cause very rapid deterioration and possible leakage. Shelf life is materially improved by storage at 70°F or lower. A temperature of 40°-50°F is very desirable.

Additional information on shelf life and storage is contained in the Bureau of Standards Publication titled "Electrical Characteristics of Dry Cells and Batteries" (Leclanché Type).

Test Procedures

Union Carbide Consumer Products Company maintains a very extensive battery test program. All types of dry batteries are checked for service capacity and shelf life under closely controlled conditions of temperature and humidity. Many tests last a year or longer. This points up the fact that there is no simple or rapid method for determining the service capacity of a dry battery. Tests must be run which closely duplicate the class of service for which the battery is intended. The schedule of operation is very important. The service capacity of a battery used two hours per day will be considerably different from that of the same battery used 12 hours per day.

There is no relation between continuous duty service and intermittent service. It is, therefore, impossible to rate the merits of different batteries on intermittent service by comparing the results of continuous duty tests.

Another fallacy concerning dry batteries is that relative "quality" or service capacity of a battery can be determined by amperage readings. This is not true and in most instances gives results which are totally misleading. The size "D" photoflash round cell and the flashlight cell are identical in size and shape. However, the photoflash cell, which will show more than twice the amperage of the flashlight cell, runs a poor second to it in service capacity in typical flashlight uses.

The short circuit amperage of a cell may be adjusted over a wide range by varying the carbon content of the depolarizing mix. Carbon contributes nothing to the cell energy and is used primarily to control cell impedance. It is apparent that as carbon is added to a cell, depolarizer must be removed. This means energy content is reduced.

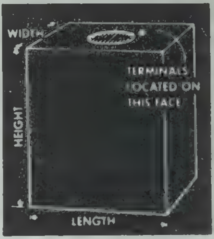
Dry batteries can be meter tested to check present condition. A meter test, however, will give no indication of remaining service capacity unless the exact history of the battery is known and can be compared on a capacity vs. meter reading basis with other batteries tested in similar service.

A loaded voltmeter is considered the best spot check device, since open circuit voltmeter readings give no indication of internal impedance and a short circuit amperage reading is damaging, especially to "B" batteries. A loaded voltmeter should impose a drain of approximately half the recommended maximum drain specified for battery types listed in this data book.

"EVEREADY" BATTERY

LECLANCHÉ (CARBON-ZINC)

DIMENSIONS . . . This battery tabulation lists maximum dimensions. To be consistent, the terminals are located on the face of the battery bounded by the length and width, with the exception of those batteries having one terminal on each end. This is shown in the sketch at right.



Battery Type Numbers (In Order of Increasing Service Capacity)	SUGGESTED CURRENT RANGE (MILLIAMPERES)	TYPICAL USE	MAXIMUM DIMENSIONS — INCHES			
			DIAMETER	LENGTH	WIDTH	HEIGHT
1½ VOLT BATTERIES						
201	0-0.06	Electric Watch	0.445			0.130
E340E	0-20	Hearing Aids	0.445			1.180
904	0-20	Flashlight, Toys	0.445			1.180
912	0-20	Flashlight	13/32			1-3/4
815	0-25	Photoflash	9/16			1-31/32
515	0-25	Flashlight	35/64			1-31/32
915	0-25	Flashlight	9/16			1-31/32
1015	0-25	Transistor Pocket Radio	9/16			1-31/32
1015E	0-25	Hearing Aid	9/16			1-31/32
1016	0-50	Pocket Radio		1-9/64	19/32	2-1/64
1016E	0-50	Hearing Aid		1-9/64	19/32	2-1/64
835	0-80	Photoflash	1-1/32			1-15/16
935	0-80	Flashlight	1-1/32			1-15/16
635	0-80	Portable "A"	1-1/32			1-15/16
1052P	0-150	Hearing Aid	1-1/16			3-29/32
850	0-150	Photoflash	1-11/32			2-13/32
950	0-150	Flashlight, Portable "A"	1-11/32			2-13/32
D99	0-150	Flashlight, Portable "A"	1-11/32			2-13/32
A100	0-150	Portable "A", Transistor	1-11/32			2-13/32
1050	0-150	Industrial Flashlight	1-11/32			2-13/32
960P	0-250	Portable "A"	1-11/32			4-1/16
964	0-300	Portable "A"	1-11/32			4-3/16
720	0-300	Portable "A"		2-25/32	1-13/32	3-1/32
W-354	0-500	Inst. & Test Equip.		2-5/8	1-5/16	4-1/8
W-353	0-500	Portable "A"		2-19/32	1-3/8	4-1/4
735	0-1000	Instruments, Hobby		2-5/8	2-5/8	4-3/8
742	0-1000	Portable "A"		2-5/8	2-5/8	3-27/32
743	0-1500	Portable "A"		3-13/16	2-5/8	4-1/32
6 "Ignitor"	0-1500	Ignition, General Purpose	2-5/8			6-21/32
6 "Gray Label"	0-1500	Telephone	2-5/8			6-21/32
6 RR & Ind.	0-1500	Misc.-Telephone-Ind.	2-5/8			6-21/32
741	0-2000	Portable "A"		3-7/8	2-11/16	5-3/8
740	0-4500	Home Receiver "A"		4-19/32	3-7/8	7-3/4

SPECIFICATIONS

DRY BATTERIES

TERMINALS . . . Over 100 different terminal arrangements are used for the batteries listed. They are illustrated and numbered to insure that designers and engineers can obtain the necessary standard connection terminals to match those on the batteries. Reference to the "Terminal Sketch" column will give the sketch number for any particular battery.

1½ VOLT BATTERIES

Battery Type Numbers (In Order of Increasing Service Capacity)	NUMBER AND SIZE OF CELLS		BATTERY WEIGHT		TERMINALS	TERMINAL SKETCH	Approx. Volume of Body of Battery (Cubic Inches)	VOLTAGE TAPS
	NUMBER	SIZE	LBS.	OZ.				
201	1			0.049	Flat Contacts	98	0.019	—, +1.5
E340E	1	N		0.22	Flat Contacts	5	0.16	—, +1.5
904	1	N		0.22	Flat Contacts	5	0.16	—, +1.5
912	1	AAA		0.3	Flat Contacts	5	0.20	—, +1.5
815	1	AA		0.6	Flat Contacts	5	0.48	—, +1.5
515	1	AA		0.6	Flat Contacts	5	0.48	—, +1.5
915	1	AA		0.6	Flat Contacts	5	0.48	—, +1.5
1015	1	AA		0.6	Flat Contacts	5	0.48	—, +1.5
1015E	1	AA		0.6	Flat Contacts	5	0.48	—, +1.5
1016	2	AA		1.1	Flat Contacts	19	1.33	—, +1.5
1016E	2	AA		1.1	Flat Contacts	19	1.33	—, +1.5
835	1	C		1.4	Flat Contacts	5	1.25	—, +1.5
935	1	C		1.4	Flat Contacts	5	1.25	—, +1.5
635	1	C		1.4	Flat Contacts	5	1.25	—, +1.5
1052P	1	335		2.5	Socket	25	3.84	—, +1.5
850	1	D		3.3	Flat Contacts	5	3.17	—, +1.5
950	1	D		3	Flat Contacts	5	3.19	—, +1.5
D99	1	D		3.3	Flat Contacts	5	3.17	—, +1.5
A100	1	D		3.3	Flat Contacts	5	3.17	—, +1.5
1050	1	D		3.3	Flat Contacts	5	3.17	—, +1.5
960P	1	F		5	Socket	25	5.55	—, +1.5
964	1	G		5.9	Flat Contacts	5	4.92	—, +1.5
720	2	D		6.5	Socket	25	10.8	—, +1.5
W-354	2	F		12	Plastic Knurls	23	14.5	—, +1.5
W-353	2	F		12.5	Socket	25	15.2	—, +1.5
735	4	F	1	7	Plastic Knurls	18	26.5	—, +1.5
742	4	F	1	6	Socket	25	26.5	—, +1.5
743	6	F	1	15	Socket	25	40.5	—, +1.5
6 "Ignitor"	1	6	2	1	Plastic Knurls or Fahnestock	3	29.3	—, +1.5
6 "Gray Label"	1	6	2	1	Plastic Knurls or Fahnestock	3	29.3	—, +1.5
6 RR & Ind.	1	6	2	1	Plastic Knurls or Fahnestock	3	29.3	—, +1.5
741	8	F	2	10	Socket	25	56.1	—, +1.5
740	18	F	6		Socket	25	138	—, +1.5

Battery Type Numbers (in Order of Increasing Service Capacity)	SUGGESTED CURRENT RANGE (MILLIAMPERES)	TYPICAL USE	MAXIMUM DIMENSIONS — INCHES			
			DIAMETER	LENGTH	WIDTH	HEIGHT
3 VOLT BATTERIES						
750	0-25	Flat Flashlight		1-7/32	5/8	2-21/32
W-371	0-50	Model Ignition		1-5/32	1-5/32	2-9/16
704	0-250	Shot Firing		2-11/16	1-11/32	4-3/8
W-352	0-250	Radio & Test Equipment		2-5/8	1-5/16	4-1/8
789	0-400	Finger Print Camera		5-9/32	1-7/16	3-1/4
W-356	0-500	Radio		2-5/8	2-5/8	4-9/16
621	0-1500	Fishing Buoy	2-9/16			13-1/8
W-357	0-1000	Telephone		3-7/8	2-11/16	5-13/16
4½ VOLT BATTERIES						
333	0-12	Pocket Transistor Radio	0.662			1.965
751	0-25	Flat Flashlight		1-25/32	5/8	2-21/32
702	0-50	Shot Firing		2-17/32	7/8	3-1/8
703	0-50	Miscellaneous		2-7/16	27/32	3-1/16
781	0-50	Portable "C"		2-7/16	27/32	3
243	0-40	Transistor Radio		1-13/32	1-11/32	2-3/4
761T	0-150	Portable "C"		4-1/16	1-13/32	3-1/32
771	0-150	Portable "C"		3-29/32	1-3/8	3-1/16
726	0-150	Portable "A"		4-3/32	1-7/16	2-15/16
714	0-200	Miscellaneous		3-31/32	1-11/32	3-5/8
736	0-250	Portable "A"		3-15/16	1-5/16	4-3/32
746	0-300	Portable "A"		3-15/16	1-5/16	4-21/32
2731	0-200	Transistor Table Model		2-13/16	1-3/4	8-11/32
6 VOLT BATTERIES						
724	0-25	Portable "A"		1-7/32	1-7/32	2-11/32
2713	0-25	Pocket Transistor Radio		1-13/32	47/64	4-11/16
509	0-250	Lantern		2-5/8	2-5/8	4-13/32
510F	0-250	Miscellaneous		2-5/8	2-5/8	4-13/32
510S	0-250	Lighting, Miscellaneous		2-5/8	2-5/8	4-3/8
744	0-250	Portable "A"		2-5/8	2-5/8	3-27/32
409	0-250	Lantern		2-5/8	2-5/8	4-13/32
2744	0-500	Barricade Flasher, Misc.		2-21/32	2-21/32	3-7/8
2745	0-500	Barricade Flasher, Lantern		2-21/32	2-21/32	4-7/16
2746	0-500	Lighting, Miscellaneous		2-21/32	2-21/32	4-3/8
274	0-80	Transistor Portable		2-9/16	2-1/32	7-29/32
718	0-500	Portable "A"		3-29/32	2-3/4	5-7/16
731	0-500	Lighting		5-11/32	2-27/32	4-15/16
706	0-1000	Emergency Lighting		8-5/16	2-13/16	6-7/16
1461	0-1500	Ignition, Lighting		10-7/16	2-23/32	7-7/32
1462	0-1500	Ignition, Lighting		5-1/4	5-1/4	7-1/4
7½ VOLT BATTERIES						
W-362	0-20	Radio "C"		2-27/32	19/32	1-29/32
713	0-50	Portable "A"		3-29/32	53/64	2-27/32
773	0-50	Portable "C"		3-29/32	27/32	3
717	0-70	Portable "A"		2-5/32	1-15/16	3-1/32
707	0-30	Portable "A"		2-9/16	2-1/32	2-13/16
715	0-1000	Emergency Lighting		7-1/4	4-1/16	6-7/16
1562	0-1500	Ignition, Lighting		7-27/32	4-31/32	7-7/32
9 VOLT BATTERIES						
206	0-7	Pocket Transistor Radio	3/4			2
216	0-8	Transistor Portable		1-1/32	21/32	1-29-32
226	0-9	Transistor Portable	1			1-15/16
2709	0-20	Pocket Transistor Radio		1-13/32	47/64	4-11/16
246	0-15	Transistor Portable		1-13/32	1-11/32	2-3/4
266	0-20	Transistor Portable		1-13/16	1-13/16	2-7/16
2506	0-150	Transistor Portable		8	2-13/16	1-9/16
276	0-30	Transistor Portable		2-9/16	2-1/32	3-5/32
2356	0-30	Transistor Portable		2-9/32	1-1/4	6-1/4
2761	0-30	Transistor Portable		2-9/32	1-1/4	7-31/32
2762	0-100	Transistor Portable or Table Model		2-13/16	1-3/4	8-11/32
716	0-1000	Emergency Lighting		8-37/64	4-1/16	6-7/16
1662	0-1500	Ignition, Lighting		7-13/16	5-9/32	7-1/4

NUMBER AND SIZE OF CELLS		BATTERY WEIGHT		TERMINALS	TER-MINAL SKETCH	Approx. Volume of Body of Battery (Cubic Inches)	VOLTAGE TAPS
NUMBER	SIZE	LBS.	OZ.				
				3 VOLT BATTERIES			
2	AA		2	Spring	91	1.62	—, +3
4	AA		2.2	Socket	33	3.45	—, +3
2	F		11.8	Socket	78	15.7	—, +3
2	F		12	Plastic Knurls	108	14.5	—, +3
4	E	1	1.5	Flat	85	24.6	—, +3
4	F	1	6	Plastic Knurls	12	28.1	—, +3
2	6	4	10	Plastic Knurls	87	67.0	—, +3
8	F	2	12	Fahnestock	32	56.1	—, +3
				4½ VOLT BATTERIES			
6	108		0.9	Flat Contacts	77	0.65	—, +4.5
3	AA		3	Spring	109	3.14	—, +4.5
3	B		5	Socket	79	6.85	—, +4.5
3	B		5	Spring	90	5.1	—, +4.5
3	B		5	Plastic Knurls	10	5.1	+, —4.5
6	146		4.5	Min. Snap	89	5.02	—, +4.5
3	D		14	Plastic Knurls	2	18.1	—, +1.5, +3, +4.5
3	D		13	Socket	13	16.5	+, —3, —4.5
3	D		10.5	Socket	6	15.2	—, +4.5
3	E		14.5	Plastic Knurls	83	16.9	—, +4.5
3	F	1		Socket	6	21.1	—, +4.5
3	G	1	3	Socket	6	24.0	—, +4.5
6	250-5	2	11	Socket	6	41.0	—, +4.5
				6 VOLT BATTERIES			
4	AA		2.5	Flat Contact	24	3.4	—, +6
4	213-1		4	Min. Snap	94	4.58	—, +6
4	F	1	5.5	Coil Springs	88	26.5	—, +6
4	F	1	4	Fahnestock	69	26.5	—, +6
4	F	1	7	Plastic Knurls	86	26.5	—, +6
4	F	1	6	Socket	15	26.5	—, +6
4	F	1	6.5	Coil Springs	88	26.5	—, +6
4	260-6	1	14	Socket	15	27.3	—, +6
4	260-6	1	14	Coil Springs	101	27.3	—, +6
4	260-6	1	14	Plastic Knurls	102	27.3	—, +6
16	175	2	7	Snap	17	41.5	—, +6
8	F	2	4	Socket	15	58.5	—, +6
8	F	3	4	Ins. Screw	76	69.5	—, +6
16	F	5	14	Ins. Screw	21	137	—, +6
4	6	9	4	Plastic Knurls	4	199	—, +6
4	6	9		Plastic Knurls	1	197	—, +6
				7½ VOLT BATTERIES			
5	N		1.5	Plastic Knurls	11	2.86	+, —4.5, —7.5
5	B		9	Socket	16	9.21	—, +7.5
5	B		9	5 Knurls—1 Wire	8	8.24	+, —1.5, —3, —4.5, —6, —7.5
5	172		8	Socket	16	13.0	—, +7.5
5	175		12	Snap	72	14.1	—, +7.5
20	F	7	10	Ins. Screw	20	173	—, +7.5
5	6	11	4	Plastic Knurls	9	273	—, +7.5
				9 VOLT BATTERIES			
6	109		1.2	Flat Contacts, Negative Recessed	84	0.85	—, +9
6	116		1.3	Min. Snap	39	1.20	—, +9
6	127		2	Snap	38	1.31	—, +9
6	208-1		4	Snap	94	4.57	—, +9
6	148		4.5	Min. Snap	27	5.02	—, +9
6	165		7	Snap	40	7.70	—, +9
6	D	1	8	Socket	73	35.1	—, +3, +6, +9
6	175		15	Snap	71	16.3	—, +9
6	240-2	1		Snap	100	17.6	—, +9
6	240-5	1	4	Socket	106	22.7	—, +9
6	250-5	2	5	Socket	106	41.0	—, +9
24	F	8	8	Ins. Screw	22	205	—, +9
6	6	13	8	Plastic Knurls	7	290	—, +9

Battery Type Numbers (in Order of Increasing Service Capacity)	SUGGESTED CURRENT RANGE (MILLI AMPERES)	TYPICAL USE	MAXIMUM DIMENSIONS — INCHES			Approx. Volume of Body of Battery (Cubic Inches)
			LENGTH	WIDTH	HEIGHT	
12 VOLT BATTERIES						
228	0-9	Communications Equipment	1" Diameter		2-7/16	1.66
2780	0-500	Flasher	5-11/32	2-27/32	4-5/32	63.1
1463	0-600	Toy Automobile, Misc.	10-7/16	2-23/32	7-7/32	199
13½ VOLT BATTERY						
239	0-10	Transistor Portable	1-21/64	1-1/32	2-11/16	3.61
15 VOLT BATTERIES						
404E	0-1.5	Hearing Aids	19/32	35/64	1-3/8	0.43
504	0-1.5	Pocket Receivers, Radio Paging	5/8	19/32	1-3/8	0.51
504E	0-1.5	Hearing Aids	5/8	19/32	1-3/8	0.51
411	0-2.5	Pocket Receivers, Radio Paging	1-1/32	5/8	1-29/64	0.95
411E	0-2.5	Hearing Aids	1-1/32	5/8	1-29/64	0.95
417	0-6	Pocket Receivers, Radio Paging	1-5/16	31/32	1-9/16	1.87
21 VOLT BATTERY						
2314	0-8	Transistor Portable	1-21/64	1-1/32	2-7/8	3.9
22½ VOLT BATTERIES						
405E	0-1.5	Hearing Aids	19/32	35/64	1-63/64	0.63
505	0-1.5	Pocket Receivers, Radio Paging	5/8	19/32	1-63/64	0.74
505E	0-1.5	Hearing Aids	5/8	19/32	1-63/64	0.74
412	0-2.5	Pocket Receivers, Radio Paging	1-1/32	5/8	2	1.26
412E	0-2.5	Hearing Aids	1-1/32	5/8	2	1.26
420	0-6	Pocket Receivers, Radio Paging	1-5/16	31/32	2-3/16	2.66
425P	0-10	Hearing Aids	1-23/64	1-1/32	3-15/16	5.52
763	0-40	Portable "B" or "C"	3-1/2	2-3/32	3-1/16	18.5
708	0-50	Shot Firing	2-5/8	2-3/4	4-13/16	34.2
778	0-50	Portable "C"	4	2-7/16	3-1/8	29.1
766T	0-150	Portable "B" or "C"	6-3/4	4-1/8	3-15/16	80.2
30 VOLT BATTERIES						
506	0-1.5	Pocket Receivers, Radio Paging	1-13/64	5/8	1-27/64	1.03
506E	0-1.5	Hearing Aids	1-13/64	5/8	1-27/64	1.03
507	0-1.5	Pocket Receivers, Radio Paging	5/8	19/32	2.605	0.97
507E	0-1.5	Hearing Aids	5/8	19/32	2.605	0.97
413	0-2.5	Pocket Receivers, Radio Paging	1-1/32	5/8	2-9/16	1.59
413E	0-2.5	Hearing Aids	1-1/32	5/8	2-9/16	1.59
430	0-6	Pocket Receivers, Radio Paging	1-5/16	1	2-13/16	3.56
430P	0-6	Hearing Aids	1-23/64	1-1/32	3-11/32	4.67
33 VOLT BATTERY						
433P	0-10	Hearing Aids	2-21/32	1-1/64	3-1/16	8.2
45 VOLT BATTERIES						
415	0-4	Portable "B", Pocket Receivers	1-3/64	5/8	3-11/16	2.35
460	0-6	Photographic	1-29/32	1-3/8	2.43	6.14
455	0-10	Portable "B"	2-21/32	1	3-11/16	9.6
455P	0-10	Hearing Aids	2-21/32	1-1/64	3-29/32	10.4
W-358	0-10	Industrial	2-15/16	1-3/16	4-1/8	12.9
W-350	0-20	Instruments & Radio	3-1/16	1-7/8	4-31/32	25.8
738	0-25	Portable "B"	3	2-5/16	4-1/8	28.6
W-351	0-40	Industrial "B"	3-5/8	2-1/4	4	27.6
W-359	0-40	Portable "B"	3-9/16	2-1/4	4-1/2	36.0
482	0-40	Portable "B"	3-19/32	1-27/32	5-3/8	36.4
762S	0-70	Portable "B", Instruments	4-3/32	2-9/16	5-7/16	53.2
484	0-70	Portable "B"	3-31/32	2-17/32	5-5/16	53.4
487	0-80	Home Receiver "B"	5-1/8	2-1/16	7-1/4	76.7
W-365F	0-150	Industrial "B"	8-1/16	2-15/16	7-5/8	168
W-365P	0-150	Industrial "B"	8-1/16	2-15/16	7-1/16	168
W-363F	0-250	Heavy Duty "B"	8-1/32	4-1/16	7-5/8	230
W-363P	0-250	Heavy Duty "B"	8-1/32	4-1/16	7-1/16	230
W-364F	0-300	Heavy Duty "B"	8-1/8	4-7/16	7-11/16	258
W-364P	0-300	Heavy Duty "B"	8-1/8	4-7/16	7-1/8	258

Battery Type Numbers (in Order of Increasing Service Capacity)	NUMBER AND SIZE OF CELLS		BATTERY WEIGHT		TERMINALS	TERMINAL SKETCH	VOLTAGE TAPS
	NUMBER	SIZE	LBS.	OZ.			
12 VOLT BATTERIES							
228	8	127		2.3	Snap	111	—, +12
2780	8	260-6	3	8	Socket	103	—, +12
1463	24	E	7	11	Plastic Knurls	4	—, +12
13½ VOLT BATTERY							
239	9	135		3	Socket	41	—, +9, +13.5
15 VOLT BATTERIES							
404E	10	104		0.5	Flat Contacts	93	—, +15
504	10	105		0.6	Flat Contacts	48	—, +15
504E	10	105		0.6	Flat Contacts	48	—, +15
411	10	112		0.95	Flat Contacts	37	—, +15
411E	10	112		0.95	Flat Contacts	37	—, +15
417	10	132		1.8	Flat Contacts	37	—, +15
21 VOLT BATTERY							
2314	14	133		3	Socket	50	+, —12, —21
22½ VOLT BATTERIES							
405E	15	104		0.67	Flat Recessed	92	—, +22.5
505	15	105		0.8	Recessed	49	—, +22.5
505E	15	105		0.8	Recessed	49	—, +22.5
412	15	112		1.3	Flat Contacts	37	—, +22.5
412E	15	112		1.3	Flat Contacts	37	—, +22.5
420	15	132		2.5	Flat Contacts	37	—, +22.5
425P	15	135		4.1	Socket	81	—, +22.5
763	15	163		13.5	Plastic Knurls	34	—, +22.5
708	15	B	1	11	Socket	80	—, +22.5
778	15	B	1	8	Fahnestock	52	+, —3, —4.5, —6, —9, —10.5, —16.5, —22.5
766T	15	D	4	10	Fahnestock	110	—, +16.5, +18, +19.5, +21, +22.5
30 VOLT BATTERIES							
506	20	105		0.9	Flat Contacts	31	—, +30
506E	20	105		0.9	Flat Contacts	31	—, +30
507	20	105		0.9	Flat Contacts	46	—, +30
507E	20	105		0.9	Flat Contacts	46	—, +30
413	20	112		1.6	Flat Contacts	37	—, +30
413E	20	112		1.6	Flat Contacts	37	—, +30
430	20	132		3.2	Flat Contacts	37	—, +30
430P	20	132		3.2	Socket	82	—, +30
33 VOLT BATTERY							
433P	22	135		6	Socket	95	—, +33
45 VOLT BATTERIES							
415	30	112		2.5	Min. Snap	42	—, +45
460	30	132		5.3	Flat Contacts	104	—, +45
455	30	135		7.8	Snap	53	—, +45
455P	30	135		8.6	Socket	96	—, +45
W-358	30	135		8.75	Plastic Knurls	51	—, +45
W-350	30	146		14.5	Plastic Knurls	29	—, +22.5, +45
738	30	AA	1	3	Socket	45	—, +22.5, +45
W-351	28	162	1	5.5	Plastic Knurls	107	—, +22.5, +45
W-359	30	163	1	11.8	Socket	44	—, +45
482	30	165	2	3	Socket	44	—, +45
762S	30	172	2	12	Plastic Knurls	26	—, +22.5, +45
484	30	172	3	2	Socket	44	—, +45
487	30	175	4	2	Socket	30	—, +22.5, +45
W-365F	30	D	7	7.5	Fahnestock	97	—, +22.5, +45
W-365P	30	D	7	7.5	Socket	35	—, +22.5, +45
W-363F	30	F	10	5	Fahnestock	28	—, +22.5, +45
W-363P	30	F	10	5	Socket	35	—, +22.5, +45
W-364F	30	G	11	14	Fahnestock	28	—, +22.5, +45
W-364P	30	G	11	14	Socket	35	—, +22.5, +45

Battery Type Numbers (in Order of Increasing Service Capacity)	SUGGESTED CURRENT RANGE (MILLIAMPERES)	TYPICAL USE	MAXIMUM DIMENSIONS — INCHES			Approx. Volume of Body of Battery (Cubic Inches)
			LENGTH	WIDTH	HEIGHT	
49½ VOLT BATTERY						
799	0-300	Camera Cranking	8	4-3/8	8-5/8	274
67½ VOLT BATTERIES						
416	0-3	Portable "B"	1-21/64	63/64	3-1/2	4.45
457	0-6	Portable "B"	2-13/16	1-3/8	2-1/2	9.46
477	0-8	Portable "B"	1-29/32	63/64	5-7/16	9.96
467	0-10	Portable "B"	2-13/16	1-3/8	3-45/64	14.2
468	0-15	Communications Equipment	2-13/16	1-3/8	3-45/64	14.2
75 VOLT BATTERY						
437	0-10	Portable "B"	1-15/16	1-15/32	6-15/32	18.2
90 VOLT BATTERIES						
479	0-8	Portable "B"	1-31/32	1-1/32	7-15/32	15.0
490	0-10	Portable "B"	3-23/32	1-3/8	3-45/64	18.8
495	0-10	Portable "B"	1-15/16	1-15/32	7-1/8	20.1
103½ VOLT BATTERY						
W-361	0-20	Portable "B"	1-11/32	1-11/32	11-23/32	20.8
225 VOLT BATTERIES						
492	0-10	Electronic Flash	3-9/16	2-29/32	4-29/32	50.9
489	0-10	Electronic Flash	4-11/32	2-11/16	4-3/16	49.4
240 VOLT BATTERY						
491	0-2.5	Electronic Flash	2-19/32	1-5/16	4-1/2	15.0
300 VOLT BATTERY						
493	0-2.5	Geiger Counters	2-11/16	2-7/32	3-29/32	23.4
510 VOLT BATTERY						
497	0-2.5	Electronic Flash	3	1-19/32	5-5/8	26.9

• • • BATTERY PACKS • • •

1½-63 VOLT PACK						
W-366	A—200 B—10-13	Portable "A-B"	9-1/32	2-1/32	4-23/32	86.6
1½-90 VOLT PACKS						
729	A—200-250-300 B—10-14	Portable "A-B"	3-27/32	2-7/32	7-13/16	66.6
W-369	A—200-250-300 B—10-14	Portable "A-B"	9-15/16	2-1/4	4-23/32	99.0
759	A—200-250-300 B—8-12	Home Receiver "A-B"	15-11/16	4-1/32	6-15/16	452

Battery Type Numbers (in Order of Increasing Service Capacity)	NUMBER AND SIZE OF CELLS		BATTERY WEIGHT		TERMINALS	TERMINAL SKETCH	VOLTAGE TAPS
	NUMBER	SIZE	LBS.	OZ.			
49½ VOLT BATTERY							
799	33	G	13	5	Fahnestock	36	—, +22.5, +45, +49.5
67½ VOLT BATTERIES							
416	46	114		4	Min. Snap	74	—, +67.5
457	45	132		7.4	Snap	54	—, +67.5
477	44	125		8.6	Snap	56	—, +67.5
467	45	135		13.5	Snap	99	—, +67.5
468	45	135		12	Snap	99	—, +67.5
75 VOLT BATTERY							
437	52	135		14.8	Snap	57	—, +75
90 VOLT BATTERIES							
479	60	125		12	Snap	105	—, +90
490	60	135		15	Snap	55	—, +90
495	60	135	1		Snap	75	—, +90
103½ VOLT BATTERY							
W-361	69	143	1	4	Flat Contacts	43	—, +103.5
225 VOLT BATTERIES							
492	150	135	2	8	Socket	47	—, +180, +225
489	152	135	2	12	Socket	65	—, +225
240 VOLT BATTERY							
491	160	112		13	Flat Recessed & Socket	67	—, +240
300 VOLT BATTERY							
493	200	112		14.5	Pin Jacks	64	—, +300
510 VOLT BATTERY							
497	336	112	1	10	Flat Recessed	70	—, +180, +510

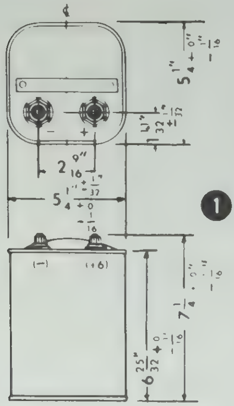
• • • BATTERY PACKS • • •

1½-63 VOLT PACK							
W-366	4 42	F 165	4	4	Socket	62	—, +1.5, —, +63
1½-90 VOLT PACKS							
729	3 60	E 135	2	7	Socket	59	—, +1.5, —, +90
W-369	4 60	G 162	4	5	Socket	59	—, +1.5, —, +90
759	3 60	6 175	16	4	Socket	59	—, +1.5, —, +90

Battery Type Numbers (in Order of Increasing Service Capacity)	SUGGESTED CURRENT RANGE (MILLIAMPERES)	TYPICAL USE	MAXIMUM DIMENSIONS — INCHES			Approx. Volume of Body of Battery (Cubic Inches)
			LENGTH	WIDTH	HEIGHT	
6-75 VOLT PACK						
W-368	A—50 B—12	Portable "A-B"	9-1/32	2-23/32	3-9/16	87.5
6-7½-75 VOLT PACK						
755	A—50 B—12	Portable "A-B"	8-9/16	3-3/4	2-7/16	78.5
7½-63 VOLT PACK						
W-367	A—50 B—12-14	Portable "A-B"	9-1/8	2-3/4	4-7/16	111
7½-75 VOLT PACK						
785	A—50 B—12	Portable "A-B"	8-3/8	3-5/8	2-1/4	68.4
7½-9-90 VOLT PACKS						
756	A—50 B—8-12	Portable "A-B"	8-7/8	2-1/8	3-25/32	71.1
753	A—50 B—12-15	Portable "A-B"	9-7/32	2-23/32	4-5/16	108
754	A—50 B—12-15	Portable "A-B"	10-15/32	3-1/4	4	136
776	A—50 B—10-12	Home Receiver "A-B"	7-27/32	4-1/8	9-7/8	320
9-90 VOLT PACKS						
727	A—50 B—8-12	Portable "A-B"	8-7/8	2-1/8	3-25/32	71.5
757	A—50 B—12-15	Portable "A-B"	9-7/32	2-23/32	4-7/32	106
752	A—50 B—12-15	Portable "A-B"	14-1/16	2-11/16	4-1/16	153
752W	A—50 B—12-15	Portable "A-B"	14-1/16	2-11/16	4-1/16	153

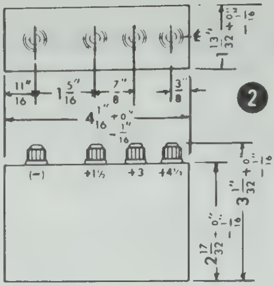
Battery Type Numbers (in Order of Increasing Service Capacity)	NUMBER AND SIZE OF CELLS		BATTERY WEIGHT		TERMINALS	TER-MINAL SKETCH	VOLTAGE TAPS
	NUMBER	SIZE	LBS.	OZ.			
6-75 VOLT PACK							
W-368	4 50	F 162	4		Recessed Plug	58	—, +6, —, +75
6-7½-75 VOLT PACK							
755	5 50	176 145	3	9	Socket	63	—, +6, +7.5, —, +75
7½-63 VOLT PACK							
W-367	5 42	G 163	4	5	Socket	14	—, +7.5, —, +63
7½-75 VOLT PACK							
785	5 52	176 146	2	12	Recessed Plug	61	—, +7.5, —, +75
7½-9-90 VOLT PACKS							
756	6 60	176 145	2	14	Socket	68	—, +7.5, +9, —, +90
753	6 60	F 162	4	12	Socket	68	—, +7.5, +9, —, +90
754	6 60	G 165	6	1	Socket	68	—, +7.5, +9, —, +90
776	18 60	F 175	14	12	Socket & Recessed Plug	68 & 60	—, +7.5, +9, —, +90
9-90 VOLT PACKS							
727	6 60	176 145	2	14	Recessed Plug	60	—, +9, —, +90
757	6 60	F 162	4	12	Recessed Plug	60	—, +9, —, +90
752	6 60	G 165	6	2	Recessed Plug	60	—, +9, —, +90
752W	6 1 60	G 960P 165	6	8	Recessed Plug	60 & 25	—, +9, —, +1.5, —, +90

TERMINAL



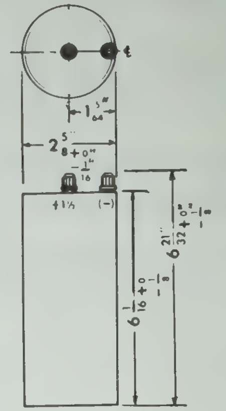
①

TERMINAL POSTS NO 8-32 THREAD



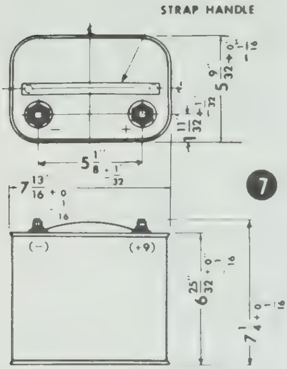
②

TERMINAL POSTS NO 8-32 THREAD



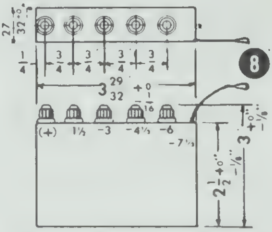
③

TERMINAL POSTS: NO. 8-32 THREAD
PLASTIC KNURLS



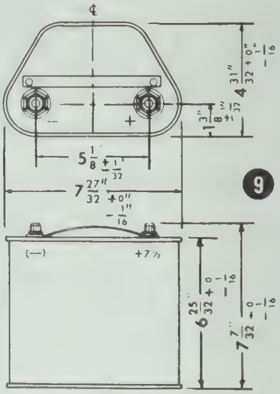
⑦

TERMINAL POSTS: NO 8-32 THREAD
PLASTIC KNURLS



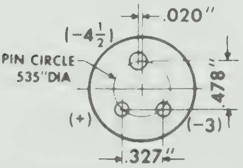
⑧

TERMINAL POSTS NO. 8-32 THREAD



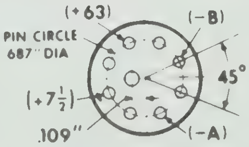
⑨

TERMINAL POSTS: NO 8-32 THREAD
PLASTIC KNURLS



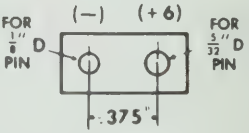
HOLES FOR 1 PIN−$\frac{5}{32}$" DIA.
AND 2 PINS−$\frac{1}{8}$" DIA.

ASA No. XI SOCKET ⑬



HOLES FOR 8 PINS-$\frac{3}{32}$" DIA
AND 1 PIN−$\frac{1}{8}$" DIA.(PILOT)

ASA No. XIV SOCKET ⑭

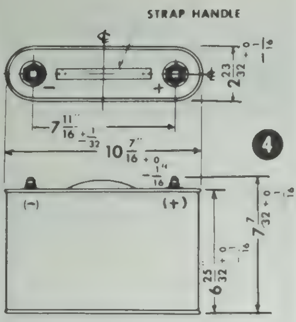


ASA No. IV
SOCKET

⑮

SKETCHES

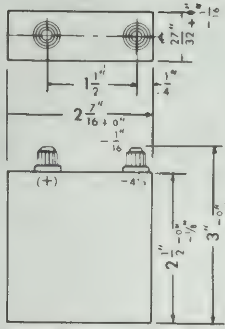
Numbered illustrations keyed to "Terminal Sketch" column on pages 20-29.



STRAP HANDLE
$2\frac{23}{32} + 0 - \frac{1}{16}$
−
+
$7\frac{11}{16} \pm \frac{1}{32}$
$10\frac{7}{16} + 0'' - \frac{1}{16}''$
(−)
(+)
$7\frac{7}{32} + 0 - \frac{1}{16}$
$6\frac{25}{32} + 0 - \frac{1}{16}$

4

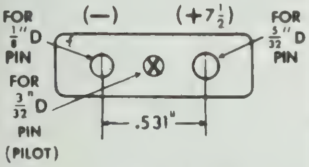
TERMINAL POSTS: NO. 8-32 THREAD
PLASTIC KNURLS
No. 1461—6 VOLTS
No. 1463—12 VOLTS



$\frac{27''}{32} + 0'' - \frac{1}{16}$
$1\frac{1}{2}''$
$\frac{1}{4}''$
$2\frac{7}{16}'' + 0'' - \frac{1}{16}''$
(+)
$-4\frac{1}{2}$
$2\frac{1}{2}'' - 0'' - \frac{1}{8}''$
$3'' - 0'' - \frac{1}{8}''$

TERMINAL POSTS NO. 8-32 THREAD

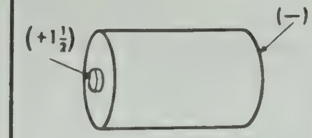
10



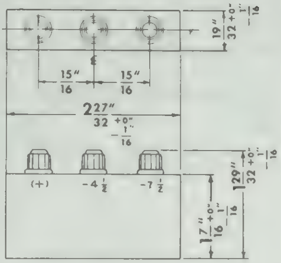
FOR $\frac{1}{8}''$ D PIN
(—)
$(+7\frac{1}{2})$
FOR $\frac{5}{32}''$ D PIN
FOR $\frac{3}{32}''$ D PIN (PILOT)
.531"

ASA No. V
SOCKET

16



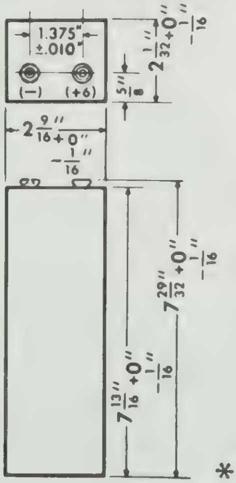
5



$\frac{19''}{32} + 0'' - \frac{1}{16}''$
$\frac{15''}{16}$
$\frac{15''}{16}$
$2\frac{27''}{32} + 0'' - \frac{1}{16}''$
(+)
$-4\frac{1}{2}$
$-7\frac{1}{2}$
$1\frac{29''}{32} + 0'' - \frac{1}{16}$
$1\frac{7''}{16} + 0'' - \frac{1}{16}$

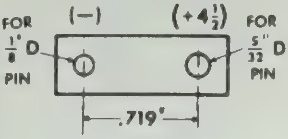
TERMINAL POSTS: NO. 8-32 THREAD
PLASTIC KNURLS

11



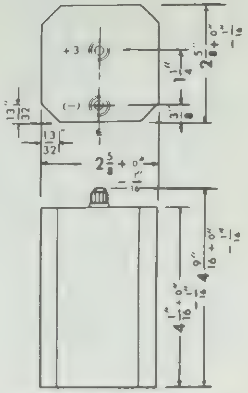
1.375"
±.010"
$2\frac{1}{32}'' + 0'' - \frac{1}{16}''$
(−)
(+6)
$\frac{5}{8}''$
$2\frac{9}{16}'' + 0'' - \frac{1}{16}''$
$7\frac{29''}{32} + 0'' - \frac{1}{16}''$
$7\frac{13''}{16} + 0'' - \frac{1}{16}$

* **17**



ASA No. III
SOCKET

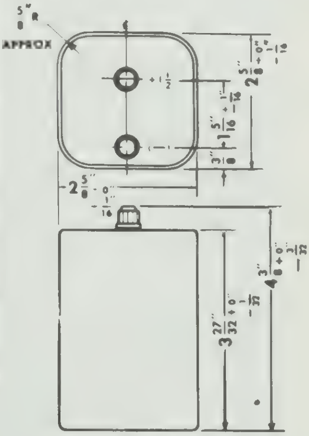
6



+3
(−)
$2\frac{5}{8}'' + 0'' - \frac{1}{16}$
$1\frac{1}{4}''$
$\frac{3}{8}''$
$\frac{13''}{32}$
$\frac{13''}{32}$
$2\frac{5}{8} + 0'' - \frac{1}{16}''$
$4\frac{9''}{16} + 0'' - \frac{1}{16}''$
$4\frac{1}{16}'' + 0'' - \frac{1}{16}''$

TERMINAL POSTS NO 8-32 THREAD

12

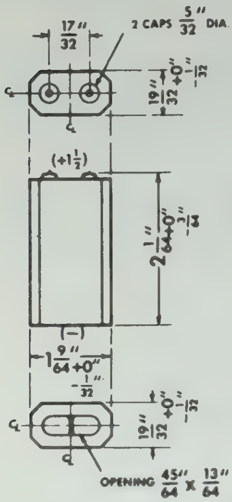


$\frac{5}{8}''$ R
APPROX
$+1\frac{1}{2}$
(−)
$2\frac{5}{8}'' + 0'' - \frac{1}{16}$
$1\frac{5''}{16} + \frac{1}{16}''$
$\frac{3}{8}''$
$2\frac{5}{8}'' - 0'' - \frac{1}{16}''$
$4\frac{3''}{8} + 0'' - \frac{1}{32}$
$3\frac{27''}{32} + 0'' - \frac{1}{32}$

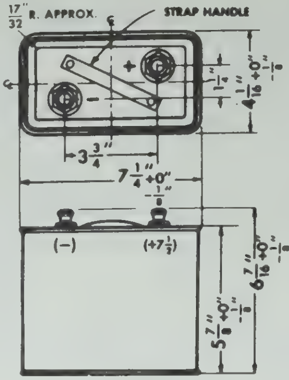
TERMINAL POSTS: NO. 8-32 THREAD
PLASTIC KNURLS

18

TERMINAL SKETCHES (continued)

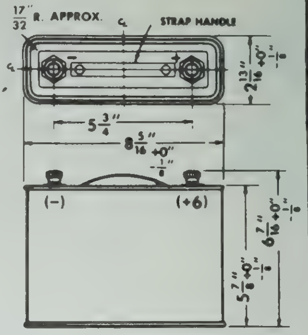


⑲



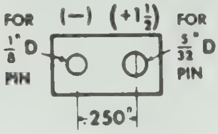
TERMINAL POSTS: No. 8-32 THREAD

⑳



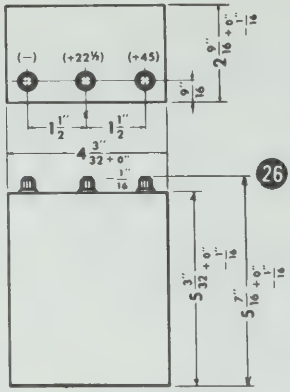
TERMINAL POSTS: No. 8-32 THREAD

㉑



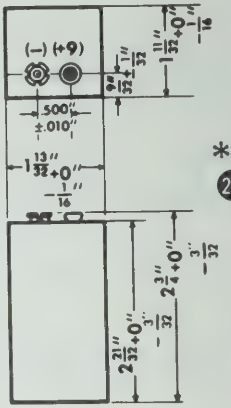
ASA No. I
SOCKET

㉕



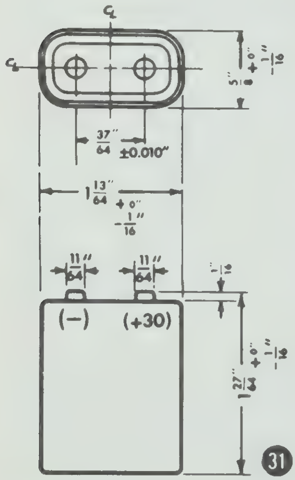
TERMINAL POSTS: NO. 8-32 THREAD

㉖

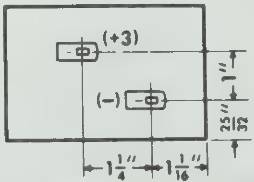


**

㉗

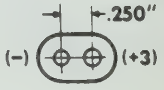


㉛



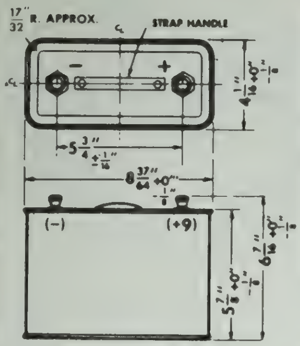
SPRING CLIP

㉜



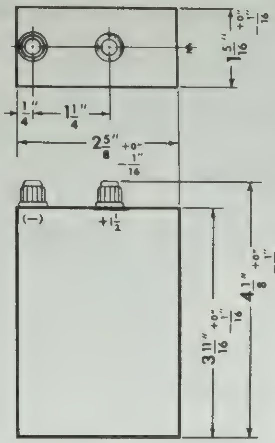
HOLES FOR 1 PIN-1/8" DIA.
AND 1 PIN-5/32" DIA.

㉝



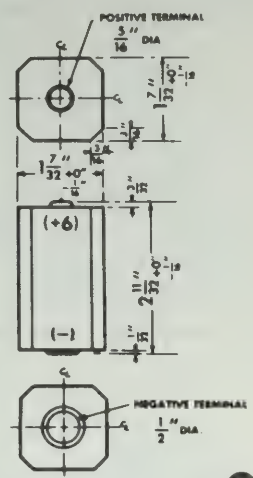
TERMINAL POSTS: No. 8-32 THREAD

㉒

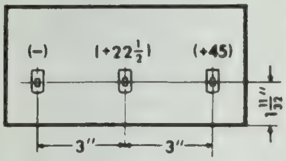


TERMINAL POSTS: NO. 8-32 THREAD
PLASTIC KNURLS

㉓

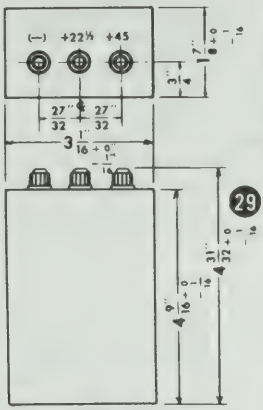


㉔



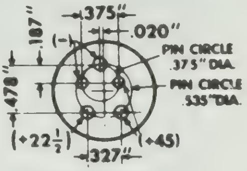
SPRING CLIP

㉘



TERMINAL POSTS NO 8-32 THREAD

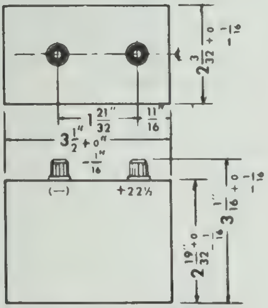
㉙



HOLES FOR 3 PINS−1/8" DIA.
OR 3 PINS−3/32" DIA.

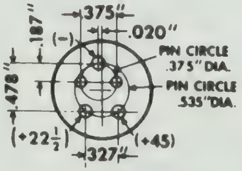
ASA No. IX SOCKET

㉚



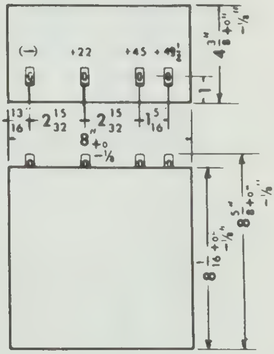
TERMINAL POSTS NO. 8-32 THREAD

㉞



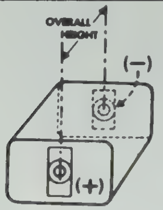
HOLES FOR 3 PINS−1/8" DIA.

㉟



㊱

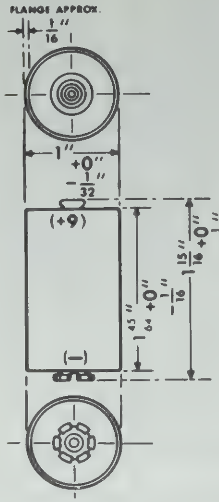
TERMINAL SKETCHES *(continued)*



㊲

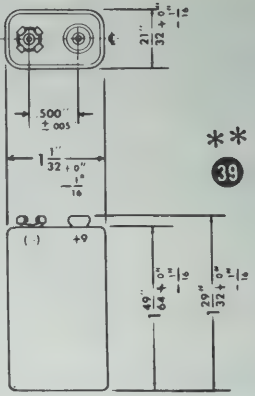
ASA No. XVI TERMINALS

FLAT CONTACT WITH 3/32" DIAMETER HOLE CENTERED IN EACH END. HEIGHT IS DISTANCE BETWEEN OUTSIDE SURFACE OF EACH TERMINAL



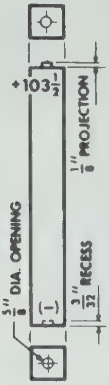
*

㊳

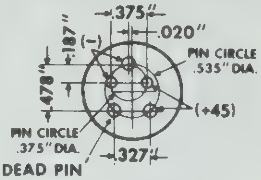


**

㊴

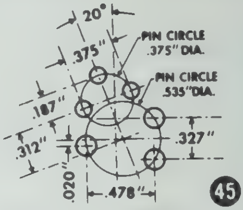


㊸



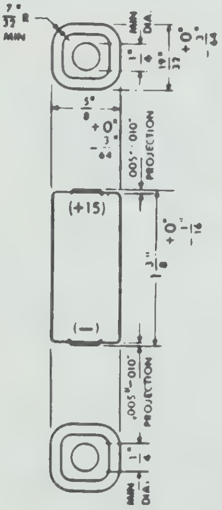
HOLES FOR 3 PINS−1/8" DIA.
OR 3 PINS−3/32" DIA. ㊹

ASA No. IX SOCKET

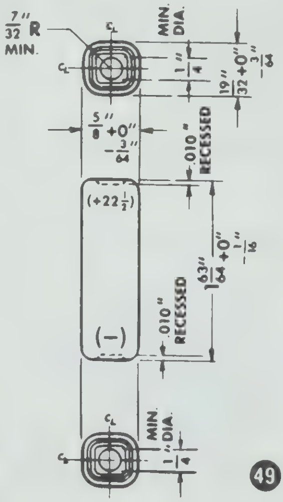


㊺

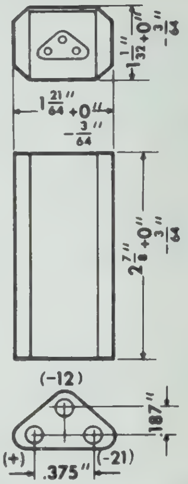
ASA No. X SOCKET
(ALSO SEE NEXT PAGE)



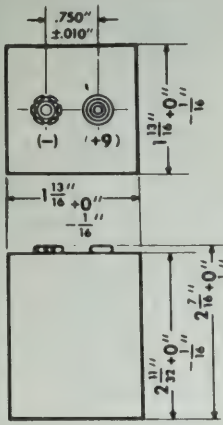
㊽



㊾

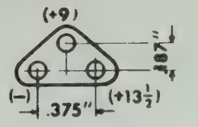


HOLES FOR 3 PINS−3/32" DIA. ㊿



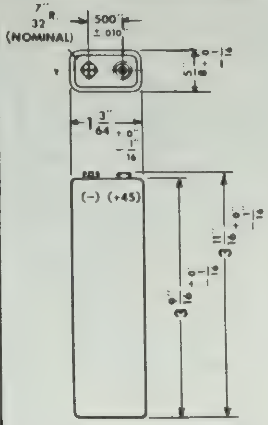
.750"
±.010"
(−)
(+9)
$1\frac{13}{16}"+0"-\frac{1}{16}"$
$1\frac{13}{16}"+0"-\frac{1}{16}"$
$2\frac{11}{32}"+0"-\frac{1}{16}"$
$2\frac{7}{16}"+0"-\frac{1}{16}"$

40



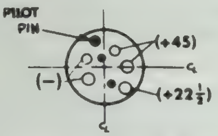
HOLES FOR 3 PINS-$\frac{3}{32}$" DIA.

41



**

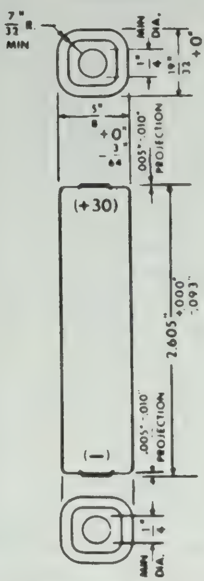
42



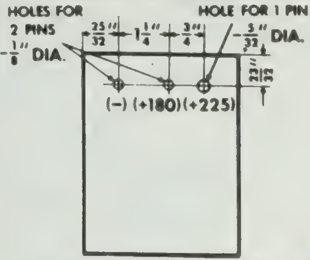
HOLES FOR 3 PINS-$\frac{3}{32}$" DIA.
OR 3 PINS-$\frac{1}{8}$" DIA.

ASA No. X SOCKET
(ALSO SEE PRECEDING PAGE)

45

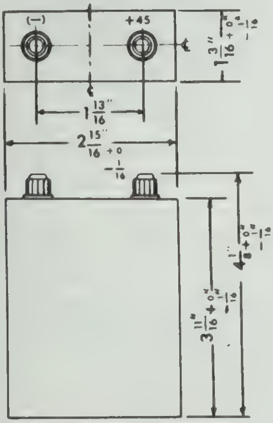


46



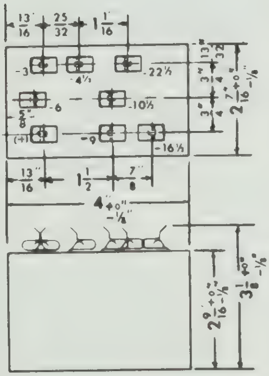
TERMINALS ARE LOCATED ON THE FACE OF THE BATTERY BOUNDED BY THE LENGTH AND HEIGHT

47

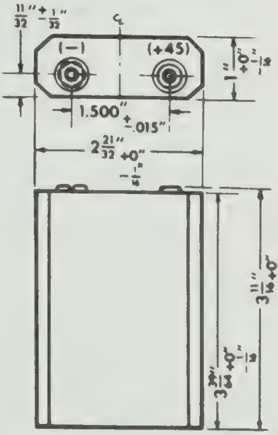


TERMINAL POSTS NO 8-32 THREAD

51



52

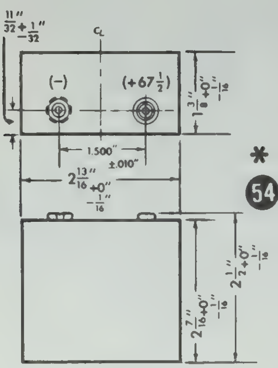


*

53

ASA No. XV TERMINALS

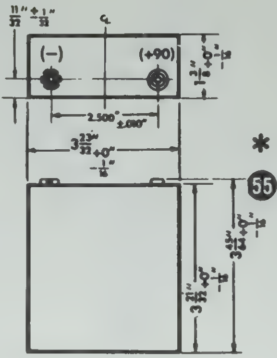
TERMINAL SKETCHES *(continued)*



*

54

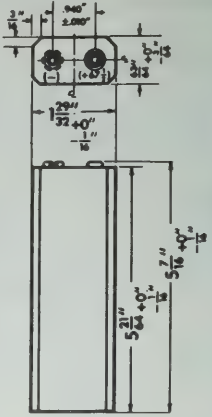
ASA No. XV
TERMINALS



*

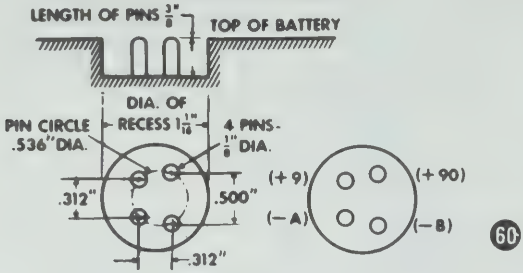
55

ASA No. XV
TERMINALS

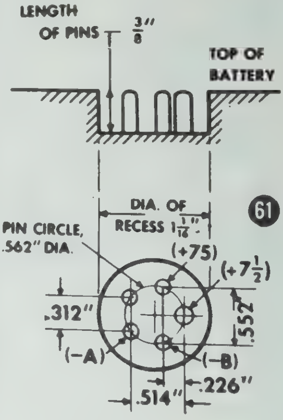


*

56

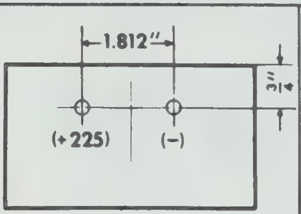


60



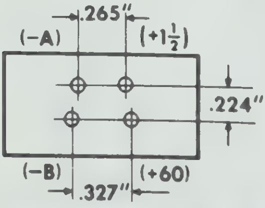
61

1 PIN–5/32" DIA.
4 PINS–1/8" DIA.



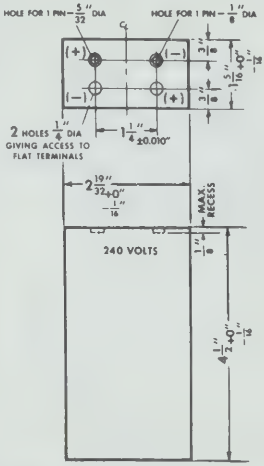
HOLES FOR 2 PINS–5/32" DIA.

65

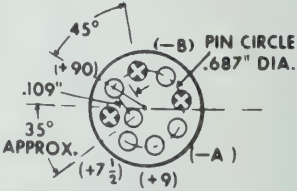


HOLES FOR 4 PINS–3/32" DIA.

66

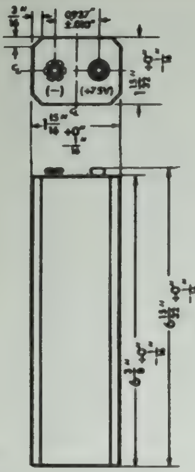


67

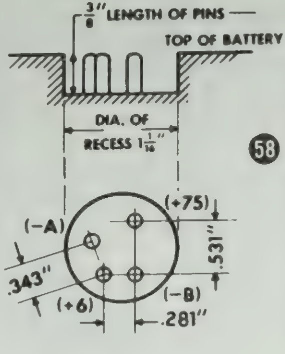


HOLES FOR 8 PINS-3/32" DIA.
AND 1 PIN–1/8" DIA.(PILOT)
ASA No. XIV SOCKET

68

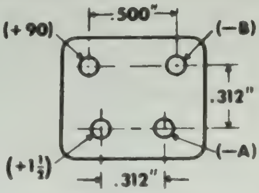


* 57



4 PINS−1/8" DIA.

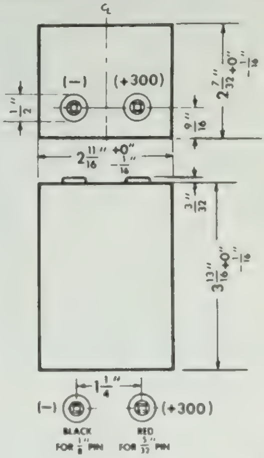
58



HOLES FOR 4 PINS−1/8" DIA.

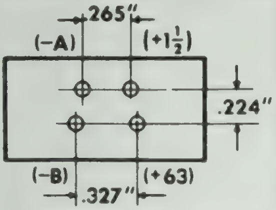
ASA No. XIII SOCKET

59



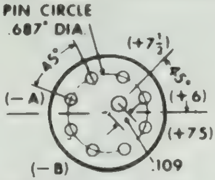
ASA No. XVIII
SOCKETS

64



HOLES FOR 4 PINS−3/32" DIA.

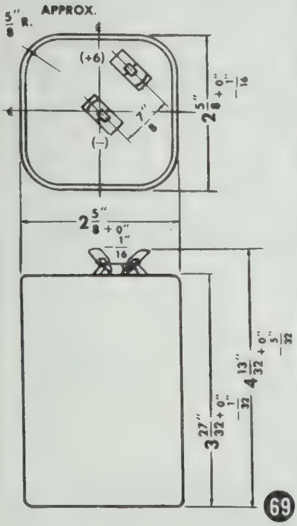
62



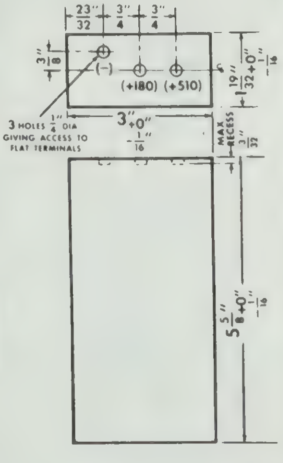
HOLES FOR 8 PINS−3/32" DIA.
AND 1 PIN−1/8" DIA.(PILOT)

ASA No. XIV SOCKET

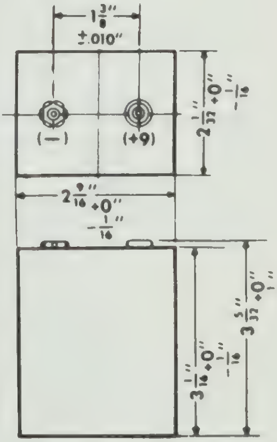
63



69

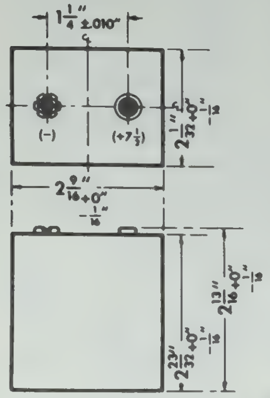


70



71 *

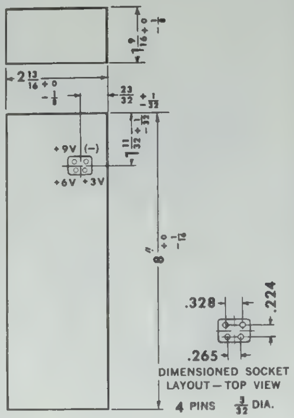
TERMINAL SKETCHES *(continued)*



$1\frac{1}{4}$ ±.010"
℄
(−)
(+7½)
$2\frac{1}{32}$" +0" −1/32
$2\frac{9}{16}$" +0" −1/16"
$2\frac{23}{32}$" +0" −1/16"
$2\frac{13}{16}$" +0" −1/16"

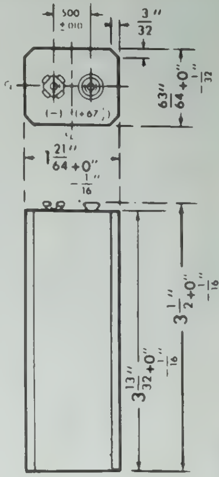
*

72



DIMENSIONED SOCKET LAYOUT — TOP VIEW
4 PINS 3/32 DIA.

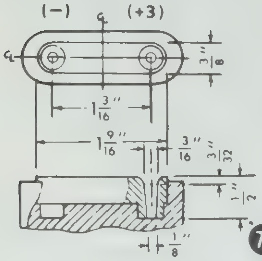
73



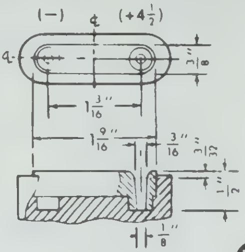
.500 ±.010
3/32"
63/64" +0" −1/32"
(−) (+67½)
$1\frac{21}{64}$" +0" −1/16"
$3\frac{1}{2}$" +0" −1/16"
$3\frac{13}{32}$" +0" −1/16"

* *

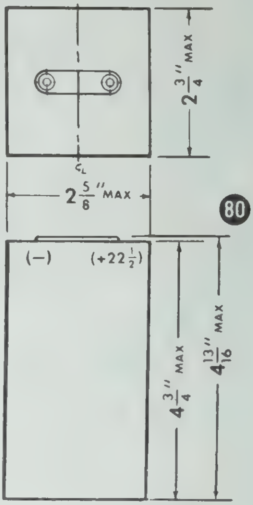
74



78

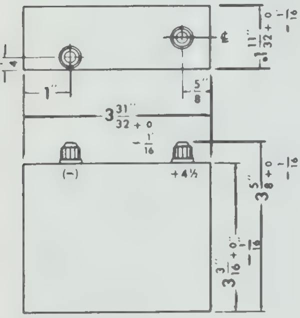


79



80

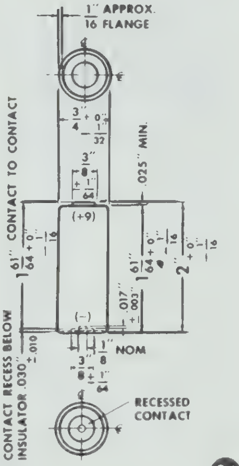
(ALSO SEE NEXT PAGE)



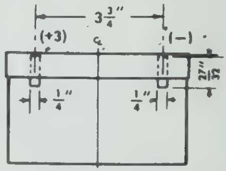
1/4
1"
5/8"
℄
$1\frac{11}{32}$ +0 −1/16
$3\frac{31}{32}$ +0 −1/16
(−)
+4½
$3\frac{5}{8}$ +0 −1/16
$3\frac{3}{16}$ +0" −1/16

TERMINAL POSTS: NO. 8-32 THREAD

83

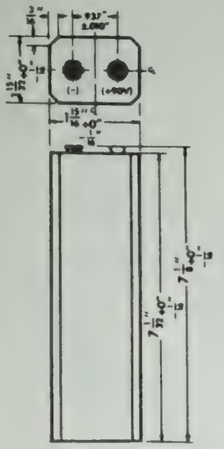


84



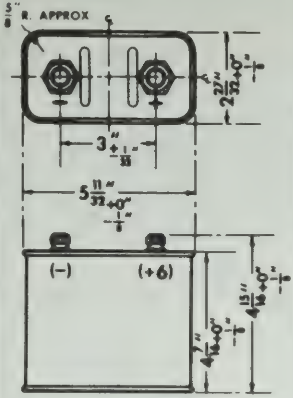
CONTACTS ARE LOCATED ON THE FACE OF THE BATTERY BOUNDED BY THE LENGTH AND HEIGHT

85



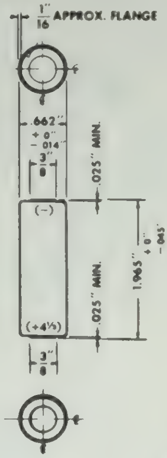
*

75

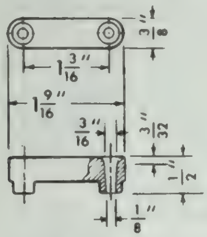


TERMINAL POSTS: No. 8-32 THREAD

76

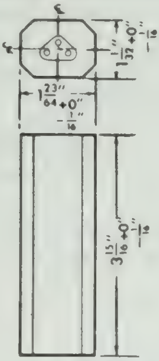


77

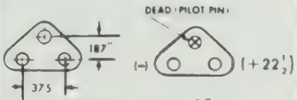


80

(ALSO SEE PRECEDING PAGE)

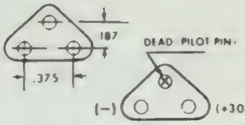


81



HOLES FOR 3 PINS-3/32" DIA.

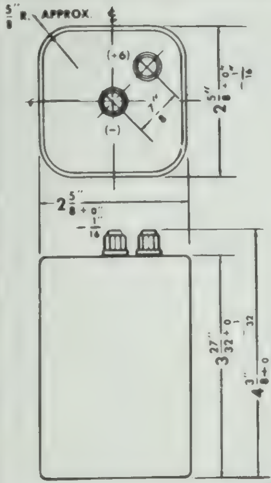
ASA No. VIII SOCKET



HOLES FOR 3 PINS-3/32" DIA.

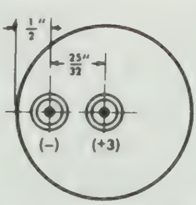
ASA No. VIII SOCKET

82



TERMINAL POSTS: NO. 8-32 THREAD

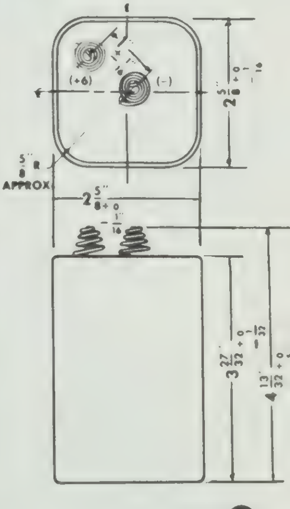
86



TERMINAL POSTS: NO. 8-32 THREAD

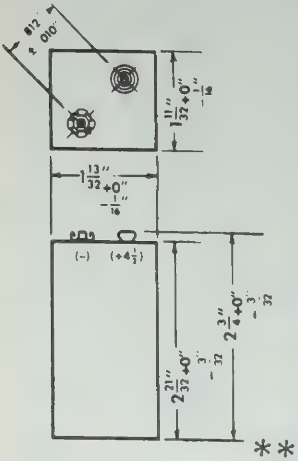
PLAIN KNURLS

87



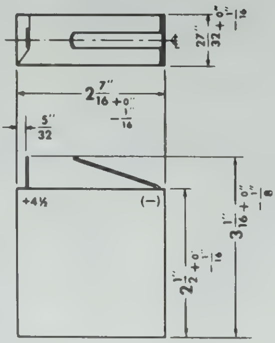
88

TERMINAL SKETCHES *(continued)*

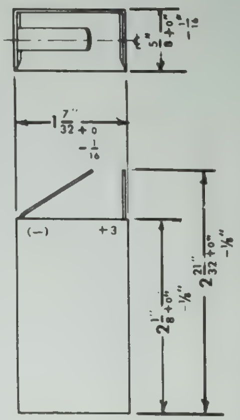


* *

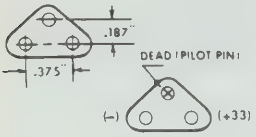
89



90

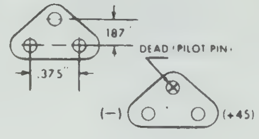


91



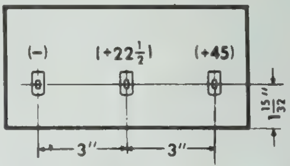
HOLES FOR 3 PINS-3/32" DIA.
ASA No. VIII SOCKET

95



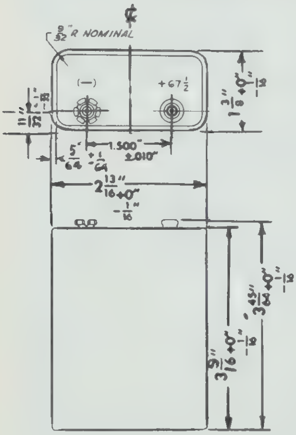
HOLES FOR 3 PINS-3/32" DIA.
ASA No. VIII SOCKET

96



SPRING CLIP

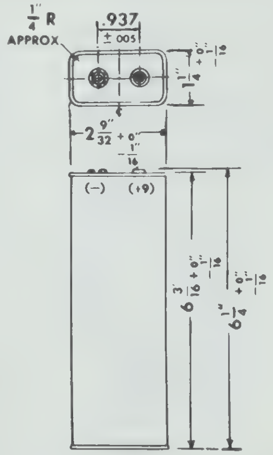
97



ASA No. XV
TERMINALS

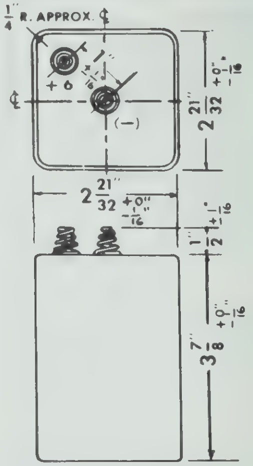
*

99

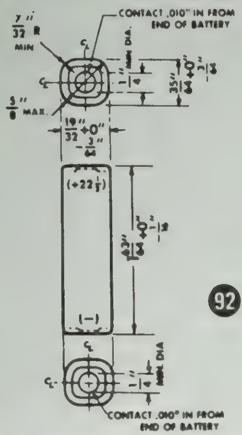


*

100

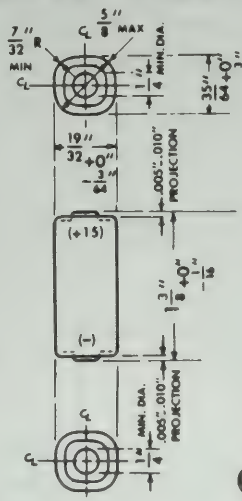


101

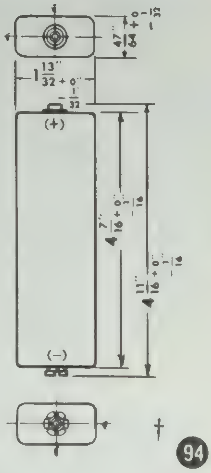


$\frac{7}{32}$" R MIN
CONTACT .010" IN FROM END OF BATTERY
℄
$\frac{1}{4}$" MIN. DIA.
$\frac{35}{64}$" +0" $-\frac{3}{64}$"
$\frac{5}{8}$" MAX.
$\frac{19}{32}$" +0" $-\frac{3}{64}$"
(+22½)
$1\frac{63}{64}$" +0" $-\frac{1}{16}$"
(−)
$\frac{1}{4}$" MIN. DIA
CONTACT .010" IN FROM END OF BATTERY

92



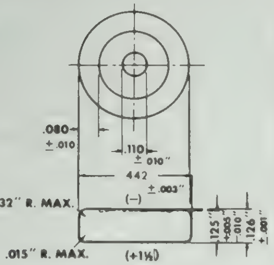
93



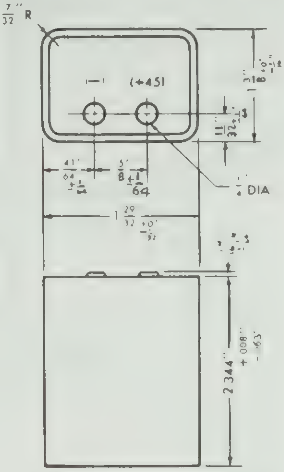
$\frac{47}{64}$" +0 $-\frac{1}{32}$
$1\frac{13}{32}$ +0 $-\frac{1}{32}$
(+)
$4\frac{7}{16}$" +0 $-\frac{1}{16}$
$4\frac{11}{16}$" +0 $-\frac{1}{16}$
(−)

†

94

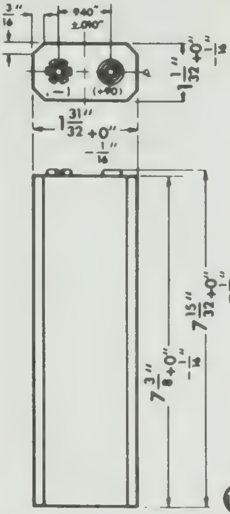


98



$\frac{7}{32}$" R
(−)
(+45)
$1\frac{1}{8}$" +0 $-\frac{1}{32}$
$\frac{11}{32}$" ± $\frac{1}{64}$
$\frac{41}{64}$" ± $\frac{1}{64}$
$\frac{5}{8}$" ± $\frac{1}{64}$
$\frac{1}{4}$ DIA
$1\frac{29}{32}$ +0 $-\frac{1}{32}$
2.344" +.008 −.153

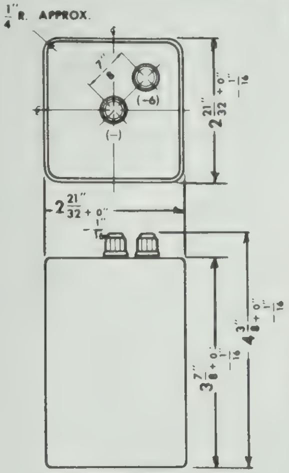
104



$\frac{3}{16}$"
.940" ±.010"
(−)
(+90)
$1\frac{1}{32}$" +0" $-\frac{1}{16}$"
$1\frac{31}{32}$" +0" $-\frac{1}{16}$"
$7\frac{3}{8}$" +0" $-\frac{1}{16}$"
$7\frac{15}{32}$" +0" $-\frac{1}{16}$"

*

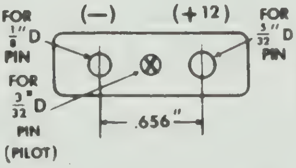
105



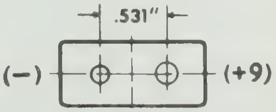
$\frac{1}{4}$" R. APPROX.
$\frac{7}{8}$"
(−6)
(−)
$2\frac{21}{32}$ +0" $-\frac{1}{16}$
$2\frac{21}{32}$" +0" $-\frac{1}{16}$"
$3\frac{7}{8}$" +0" $-\frac{1}{16}$
$4\frac{3}{8}$" +0" $-\frac{1}{16}$

TERMINAL POSTS: NO. 8-32 THREAD

102



103

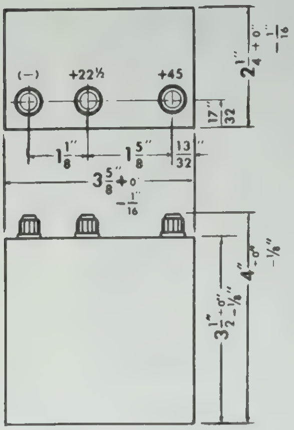


HOLES FOR 1 PIN−$\frac{1}{8}$" DIA.
AND 1 PIN−$\frac{5}{32}$" DIA.

ASA No. VI SOCKET

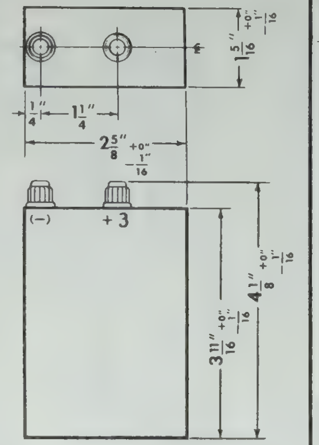
106

TERMINAL SKETCHES (*continued*)



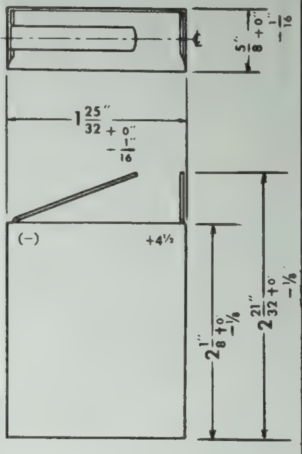
TERMINAL POSTS: NO. 8-32 THREAD

107

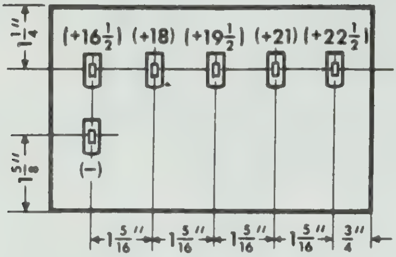


TERMINAL POSTS: NO. 8-32 THREAD
PLASTIC KNURLS

108

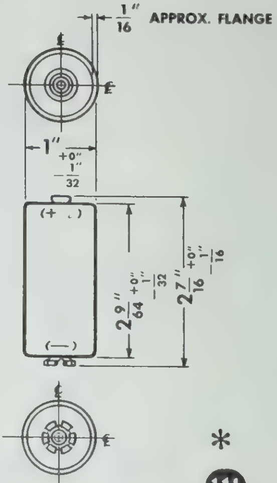


109



SPRING CLIP

110



*

111

† BATTERY No. 2709 HAS
SNAP TERMINALS*
BATTERY No. 2713 HAS
MINIATURE SNAP TERMINALS**

* TERMINALS: SNAP TYPE
UNITED-CARR FASTENER CORP.
STUD No. —BS 12302 (POSITIVE)
SOCKET No. —BS 12217 (NEGATIVE)

** TERMINALS: MINIATURE SNAP
UNITED-CARR FASTENER CORP.
STUD No. —BS 52719 (POSITIVE)
SOCKET No. —HS 52784 (NEGATIVE)

BATTERY SERVICE LIFE . . . The ampere-hour capacity of a Leclanché type dry battery is not a fixed value. It varies with current drain, operating schedule, cut-off voltage, temperature and storage period of the battery prior to use. Approximate service capacity for each cell used in the batteries shown in the specification listing for Leclanché batteries is given below for three different current drains. The values given are for fresh batteries at 70°F; the operating schedule is 2 hours per day. The cut-off voltage is 1.0 volt per 1.5 volt cell for the first 10 cells listed and 0.8 volt per 1.5 volt cell for all of the remaining cells except Nos. 176 and 335 (Values for these two cells are based on service to 1.0 volt.) This is in accord with the cut-off voltages usually associated with their use.

The data below are based on starting drains and constant resistance tests.

From the voltage of the battery and the total number of cells, determine the number of 1½ volt cells in series and in parallel. Service capacity is shown below for single 1½ volt cells. If a battery uses cells in parallel, divide the current drain which the battery is supplying by the number of parallel strings of cells, and enter the table with this value of current to determine service life.

CELL	STARTING DRAIN (Milliamperes)	SERVICE CAPACITY (Hours)	CELL	STARTING DRAIN (Milliamperes)	SERVICE CAPACITY (Hours)	CELL	STARTING DRAIN (Milliamperes)	SERVICE CAPACITY (Hours)
N	1.5	275	105	0.4	210	143	2	190
	7.5	52		2	30		10	40
	15	24		4	8		20	15
AAA	2	290	108	0.5	435	145	2	510
	10	45		2.5	103		10	105
	20	17		5	51		20	43
AA	3	350	109	0.6	710	146	2	560
	15	40		3	155		10	115
	30	15		6	75		20	50
B	5	420	112	0.7	210	148	2	610
	25	65		3.5	35		10	130
	50	25		7	12		20	70
C	5	430	114	0.7	300	162	3	550
	25	100		3.5	57		15	150
	50	40		7	25		30	65
D	10	500	116	0.8	475	163	3	600
	50	105		4	98		15	165
	100	45		8	49		30	72
E	15	400	125	1	500	165	3	770
	75	70		5	105		15	200
	150	30		10	45		30	90
F	15	520	127	1	475	172	5	780
	75	105		5	150		25	200
	150	45		10	72		50	90
G	15	1000	132	1.3	275	175	5	1000
	75	150		6.5	40		25	260
	150	65		13	16		50	110
6	50	700	133	1.3	450	176	10	910
	250	150		6.5	80		50	165
	500	70		13	35		100	63
104	0.4	200	135	1.3	450	208-1	3	370
	2	28		6.5	108		15	75
	4	7		13	52		30	35

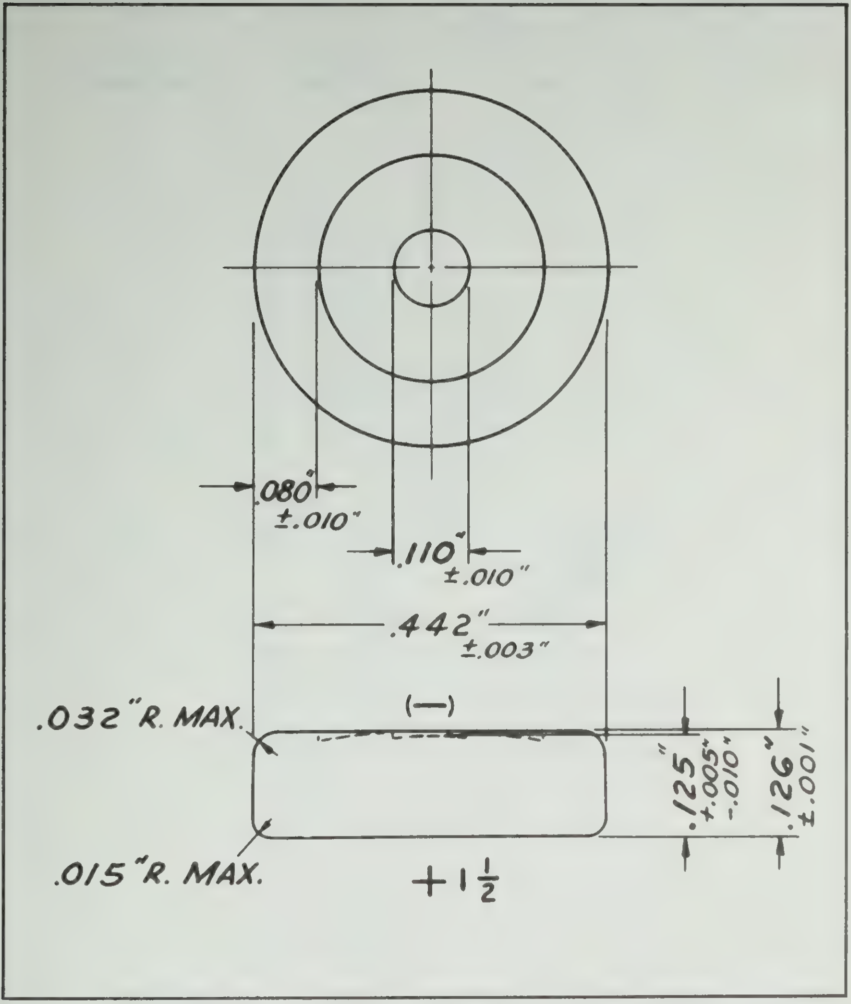
CELL	STARTING DRAIN (Milliamperes)	SERVICE CAPACITY (Hours)
213-1	3	550
	15	110
	30	50
240-2	5	630
	25	270
	50	110

CELL	STARTING DRAIN (Milliamperes)	SERVICE CAPACITY (Hours)
240-5	5	1000
	25	430
	50	180
250-5	5	1800
	25	750
	50	375

CELL	STARTING DRAIN (Milliamperes)	SERVICE CAPACITY (Hours)
260-6	10	1900
	50	445
	100	210
335	10	375
	50	78
	100	37

"EVEREADY" NO. 201 CELL

Type — Leclanché
Suggested Current Range: 0-60 microamperes



SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	0.049 oz.
Volume	0.019 cubic inch

For service information see reverse side of this sheet

"EVEREADY" NO. 201

Estimated Hours Service at 70°F

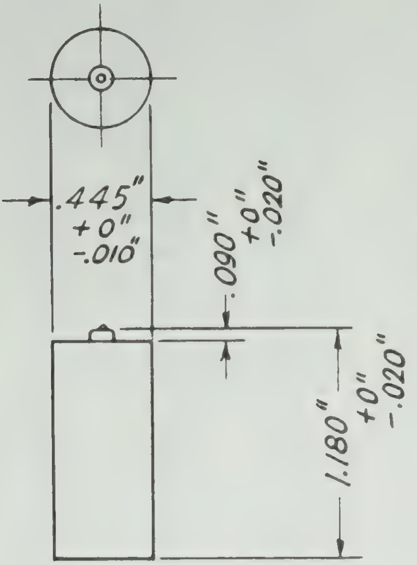
SCHEDULE	STARTING DRAINS- (microamperes)	LOAD- (ohms)	CUT-OFF VOLTAGE 1.3 V
24 hrs./day	7	214,300	12 months
	100	15,000	650 hours

"EVEREADY" NO. E340E CELL

Type — Leclanché

ASA Designation—"N"

Suggested Current Range: 0-20 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	0.22 oz.
Volume	0.16 cubic inch
Cell	One No. 4 (ASA "N")

For service information see reverse side of this sheet

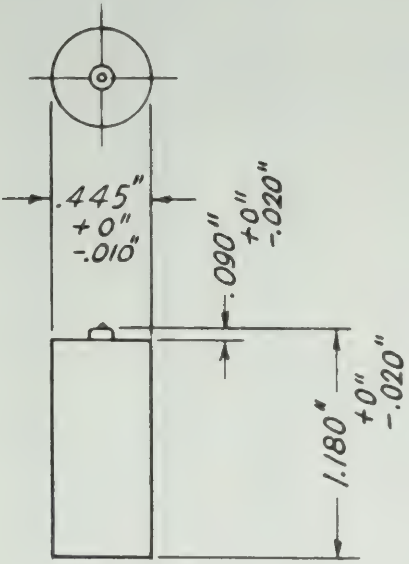
"EVEREADY" NO. E340E

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		0.8V	0.9V	1.0V	1.1V	1.2V
2 hrs./day	0.5	940	910	880	820	780
	1.0	485	460	440	410	360
	2.5	190	180	170	155	130
	5.0	94	88	81	71	60
	10	45	40	37	34	28
	20	22	18	16	13.5	11
	30	13	11	9.5	7.5	5.5
	50	5.4	4.9	4.1	3.2	2.2
	100	1.8	1.6	1.2	0.8	0.5
4 hrs./day	0.5	940	910	880	820	780
	1.0	485	460	440	410	360
	2.5	195	180	170	155	130
	5.0	92	86	80	72	60
	10	45	40	36.5	32	26
	20	20.5	17	15.5	12.5	10.5
	30	12	10.5	9	7.4	5.3
12 hrs./day	0.5	950	910	880	840	810
	1.0	485	465	440	420	385
	2.5	185	175	160	150	135
	5.0	88	81	74	68	60
	10	40	36	32	29	24.5
	20	17	15	12	10.5	9
24 hrs./day	0.5	970	930	890	850	800
	1.0	485	455	435	405	370
	2.5	185	170	160	145	135
	5.0	84	80	72	65	56
	10	36	33	30	27	23
	20	14.5	13	12	10.5	9
	30	8.2	7.4	6.6	5.7	4.7
	50	4.2	3.6	3.1	2.7	2.2
	100	1.8	1.6	1.2	0.8	0.5

"EVEREADY" NO. 904 CELL

Type — Leclanché
ASA Designation—"N"
NEDA Number—910
Suggested Current Range: 0-20 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	0.22 oz.
Volume	0.16 cubic inch
Cell	One No. 4 (ASA "N")

For service information see reverse side of this sheet

"EVEREADY" NO. 904

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		0.8V	0.9V	1.0V	1.1V	1.2V
2 hrs./day	0.5	940	910	880	820	780
	1.0	485	460	440	410	360
	2.5	190	180	170	155	130
	5.0	94	88	81	71	60
	10	45	40	37	34	28
	20	22	18	16	13.5	11
	30	13	11	9.5	7.5	5.5
	50	5.4	4.9	4.1	3.2	2.2
	100	1.8	1.6	1.2	0.8	0.5
4 hrs./day	0.5	940	910	880	820	780
	1.0	485	460	440	410	360
	2.5	195	180	170	155	130
	5.0	92	86	80	72	60
	10	45	40	36.5	32	26
	20	20.5	17	15.5	12.5	10.5
	30	12	10.5	9	7.4	5.3
12 hrs./day	0.5	950	910	880	840	810
	1.0	485	465	440	420	385
	2.5	185	175	160	150	135
	5.0	88	81	74	68	60
	10	40	36	32	29	24.5
	20	17	15	12	10.5	9
24 hrs./day	0.5	970	930	890	850	800
	1.0	485	455	435	405	370
	2.5	185	170	160	145	135
	5.0	84	80	72	65	56
	10	36	33	30	27	23
	20	14.5	13	12	10.5	9
	30	8.2	7.4	6.6	5.7	4.7
	50	4.2	3.6	3.1	2.7	2.2
	100	1.8	1.6	1.2	0.8	0.5

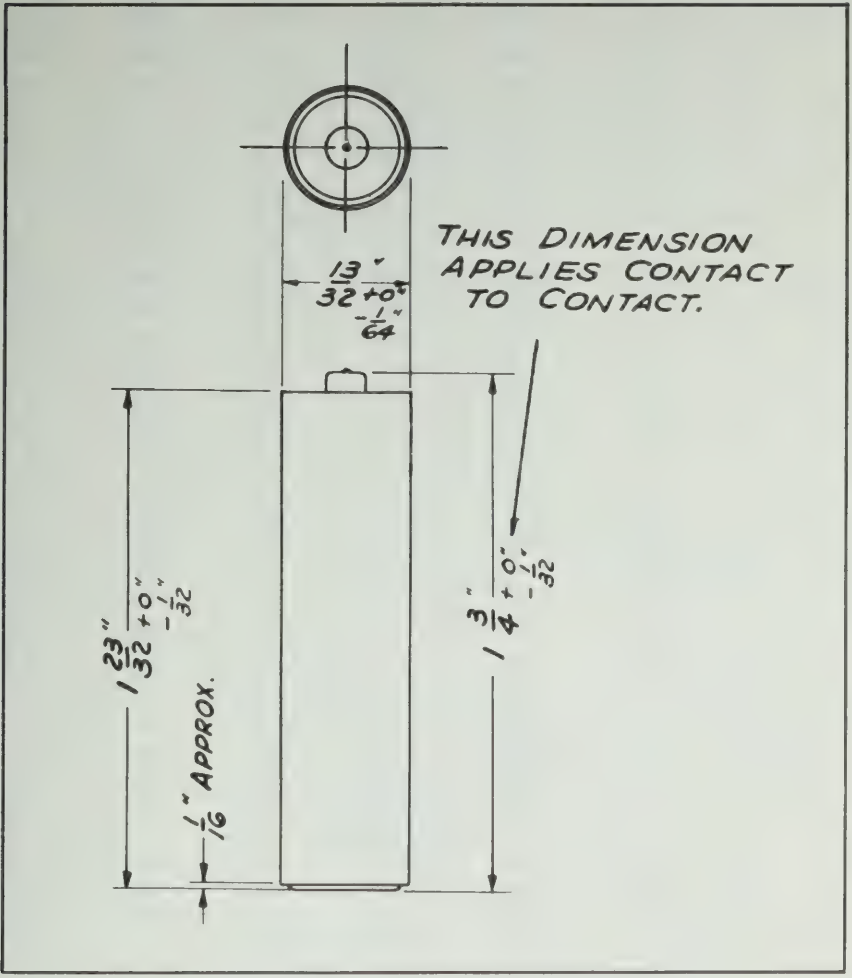
"EVEREADY" NO. 912 CELL

Type — Leclanché

ASA Designation—"AAA"

NEDA Number—24

Suggested Current Range: 0-20 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	0.3 oz.
Volume	0.20 cubic inch
Cell	One No. 12 (ASA "AAA")

For service information see reverse side of this sheet

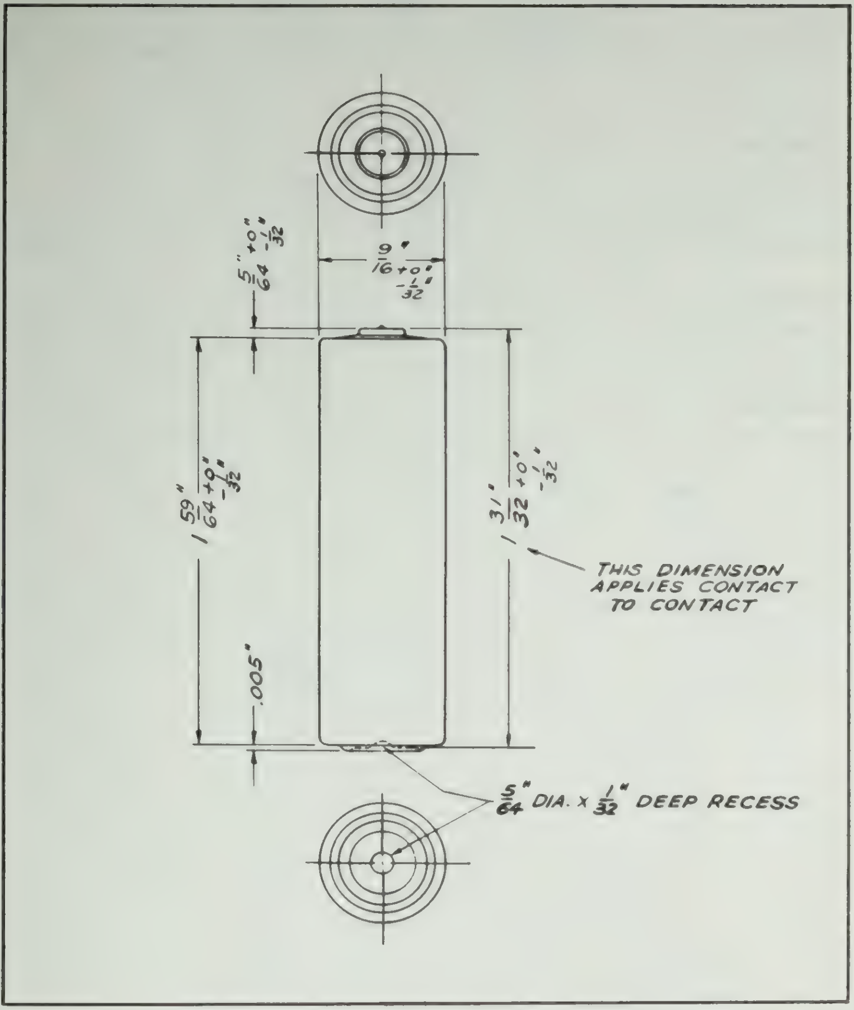
"EVEREADY" NO. 912

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS	CUT-OFF VOLTAGE				
	(milliamperes)	0.8V	0.9V	1.0V	1.1V	1.2V
2 hrs./day	2	350	320	300	270	250
	2.5	289	266	247	228	204
	5	128	118	108	97	80
	10	54	47	43	39	32
	20	21	18	15	13	10
	50	5.5	4.5	3.5	1.7	1.1
	100	1.8	1.5	1.0	0.5	0.4
4 hrs./day	2	310	290	270	245	220
	2.5	237	228	213	185	171
	5	112	104	97	81	75
	10	49	44	40	33	28
	20	18.5	17	14	11.5	8.4
	30	10	8.8	7.8	5.1	3.4
12 hrs./day	2	320	285	260	230	200
	2.5	247	223	204	175	154
	5	114	100	90	77	65
	10	48	41	37	31	24
	20	18	15	11	8	6
	30	9	7.4	5.9	4.5	2.9
24 hrs./day	2	320	270	235	195	155
	2.5	250	204	175	147	114
	5	135	108	90	73	55
	10	40	30	24	19	14
	20	15.5	12	11	8	6
	50	4.2	3.2	2.3	1.7	1.1
	100	1.8	1.5	1.0	0.5	0.4

"EVEREADY" NO. 815 CELL

Type — Leclanché
ASA Designation—"AA"
Suggested Current Range: 0-25 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	0.6 oz.
Volume	0.48 cubic inch
Cell	One No. 15 (ASA "AA")

For service information see reverse side of this sheet

"EVEREADY" NO. 815

Estimated Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE		
			0.25V	0.75V	0.9V
24 hrs./day	375	4		35 min.	
4 min./hr. 8 hrs./day 16 hrs.-rest (Light-Industrial Flashlight Test)	375	4			60 min.
Discharge for 5 minute periods at 24 hour intervals (Household Intermittent Test)	375	4		125 min.	
Discharge 1 second each minute for 1 hour at 24 hour intervals for 5 days per week (ASA Photoflash Test)		0.15	500 flashes		

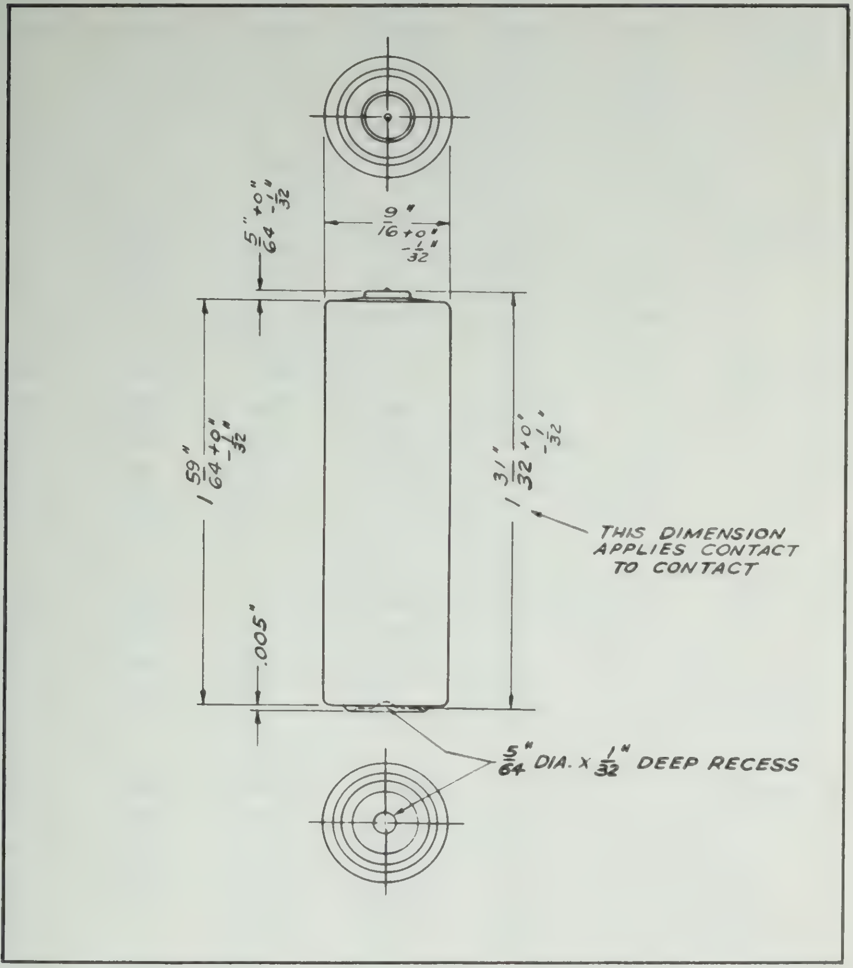
1.5
Volts

"EVEREADY" NO. 915 CELL

Type — Leclanché

ASA Designation—"AA"

Suggested Current Range: 0-25 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	0.6 oz.
Volume	0.48 cubic inch
Cell	One No. 15 (ASA "AA")

For service information see reverse side of this sheet

"EVEREADY" NO. 915

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 0.8V	0.9V	1.0V	1.1V	1.2V
2 hrs./day	5	265	255	240	210	145
	10	125	120	110	92	60
	20	54	50	46	36	22
	30	32	28	25	20	11
	50	14	12	10	8	3.8
4 hrs./day	5	260	250	230	200	130
	10	120	110	98	84	54
	20	48	43	37	30	18
	30	26	22	18	14	7.6
8 hrs./day	1	1275	1190	1080	950	680
	2	620	560	500	420	300
	5	240	225	200	160	105
	10	110	94	78	64	42
	20	42	35	28	21	14
	30	22	18	15	10.5	6.7
12 hrs./day	1	1420	1280	1210	1120	820
	2	700	640	600	510	360
	5	230	215	180	140	100
	10	100	84	74	60	37
	20	40	33	26	19	11
24 hrs./day	1	1440	1250	1180	1040	700
	2	670	580	500	420	300
	5	220	200	160	130	90
	10	94	80	66	52	35
	20	37	30	25	19	11
	30	20	16	13	9	6.7
	50	10	8.5	6.8	4.8	2.8

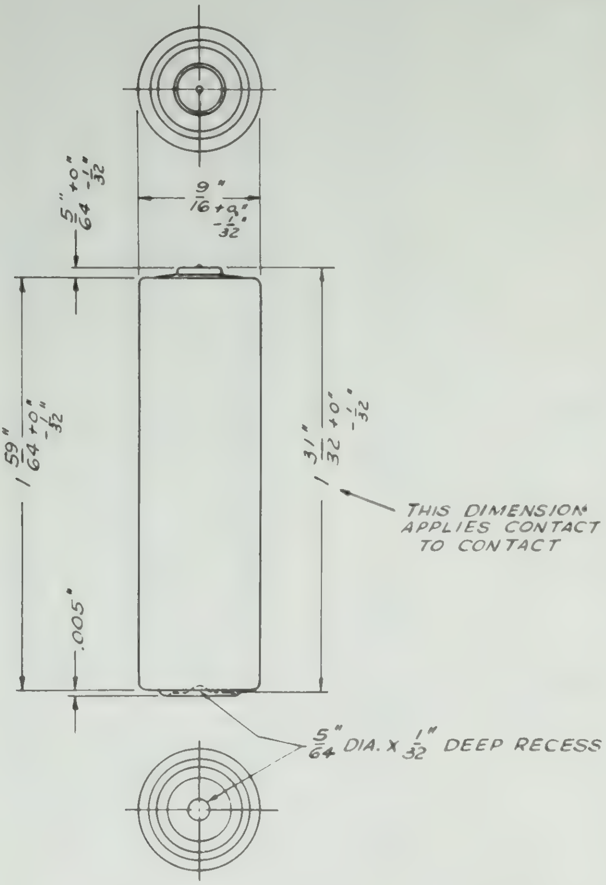
"EVEREADY" NO. 1015 CELL

Type — Leclanché

ASA Designation—"AA"

NEDA Number—15

Suggested Current Range: 0-25 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	0.6 oz.
Volume	0.48 cubic inch
Cell	One No. 15 (ASA "AA")

For service information see reverse side of this sheet

"EVEREADY" NO. 1015

Estimated Hours Service at 70°F

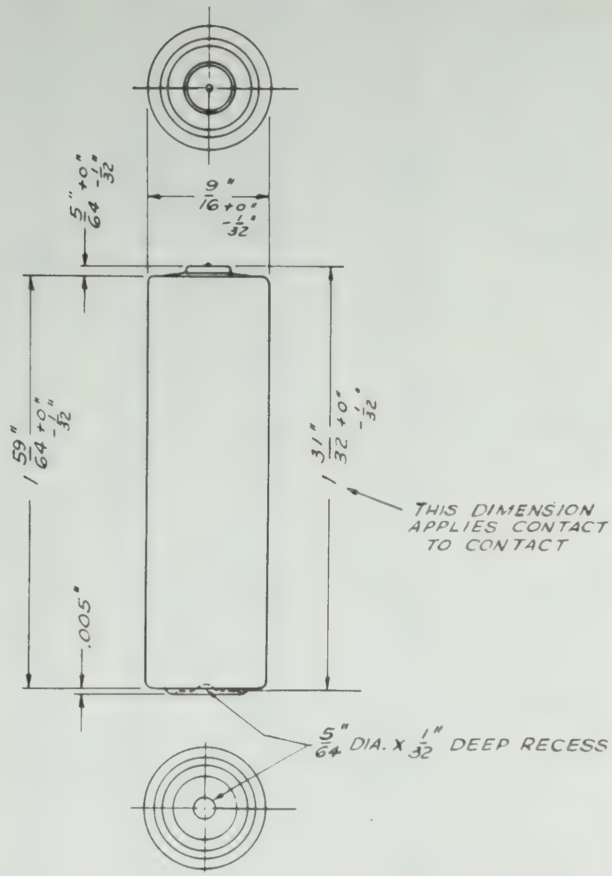
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		0.8V	0.9V	1.0V	1.1V	1.2V
2 hrs./day	5	290	285	275	270	250
	10	145	140	135	130	115
	20	72	68	64	60	49
	30	45	43	39	35	27
	50	25	22	19	16	12
	100	8.5	7	6	4	2.5
4 hrs./day	5	295	280	270	260	240
	10	150	145	135	120	110
	20	70	64	60	52	40
	30	43	38	35	29	20
	50	18	16	14.5	12	8
8 hrs./day	5	295	280	255	240	220
	10	150	135	120	110	100
	20	66	60	55	45	34
	30	40	32	28	23	17
12 hrs./day	5	280	265	245	230	200
	10	150	135	120	100	90
	20	58	54	50	40	32
24 hrs./day	5	270	255	230	210	185
	10	117	110	98	88	74
	20	49	45	40	34	28
	30	28	26	23	19	15.5
	50	14	13	11.5	9	7
	100	5	4.5	4	3	2.3

"EVEREADY" NO. 1015E CELL

Type — Leclanché

ASA Designation—"AA"

Suggested Current Range: 0-25 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	0.6 oz.
Volume	0.48 cubic inch
Cell	One No. 15 (ASA "AA")

For service information see reverse side of this sheet

"EVEREADY" NO. 1015E

Estimated Hours Service at 70°F

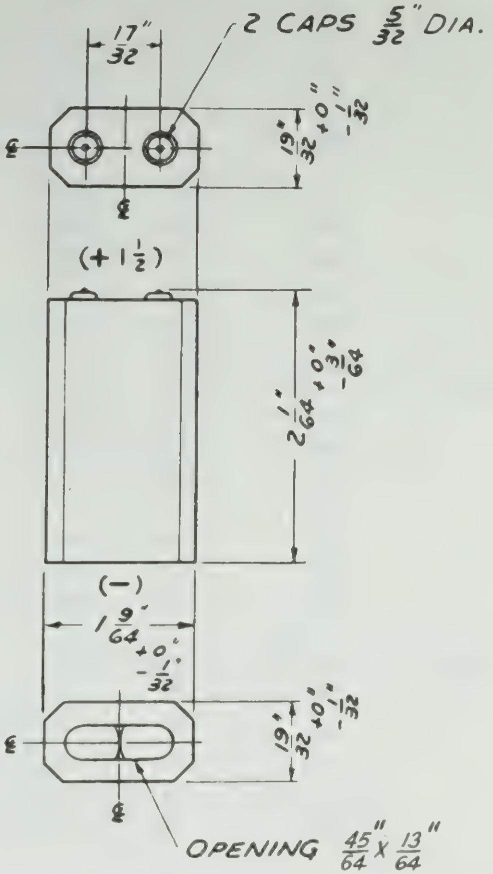
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		0.8V	0.9V	1.0V	1.1V	1.2V
2 hrs./day	5	290	285	275	270	250
	10	145	140	135	130	115
	20	72	68	64	60	49
	30	45	43	39	35	27
	50	25	22	19	16	12
	100	8.5	7	6	4	2.5
4 hrs./day	5	295	280	270	260	240
	10	150	145	135	120	110
	20	70	64	60	52	40
	30	43	38	35	29	20
	50	18	16	14.5	12	8
8 hrs./day	5	295	280	255	240	220
	10	150	135	120	110	100
	20	66	60	55	45	34
	30	40	32	28	23	17
12 hrs./day	5	280	265	245	230	200
	10	150	135	120	100	90
	20	58	54	50	40	32
24 hrs./day	5	270	255	230	210	185
	10	117	110	98	88	74
	20	49	45	40	34	28
	30	28	26	23	19	15.5
	50	14	13	11.5	9	7
	100	5	4.5	4	3	2.3

"EVEREADY" NO. 1016 BATTERY

Type — Leclanché

ASA Designation—"AA2"

Suggested Current Range: 0-50 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 1.5
Terminals	Flat Contacts
Average Weight	1.1 oz.
Volume	1.33 cubic inches
Cells	Two No. 15 (ASA "AA") (not connected)

For service information see reverse side of this sheet

"EVEREADY" NO. 1016

Estimated Hours Service at 70°F

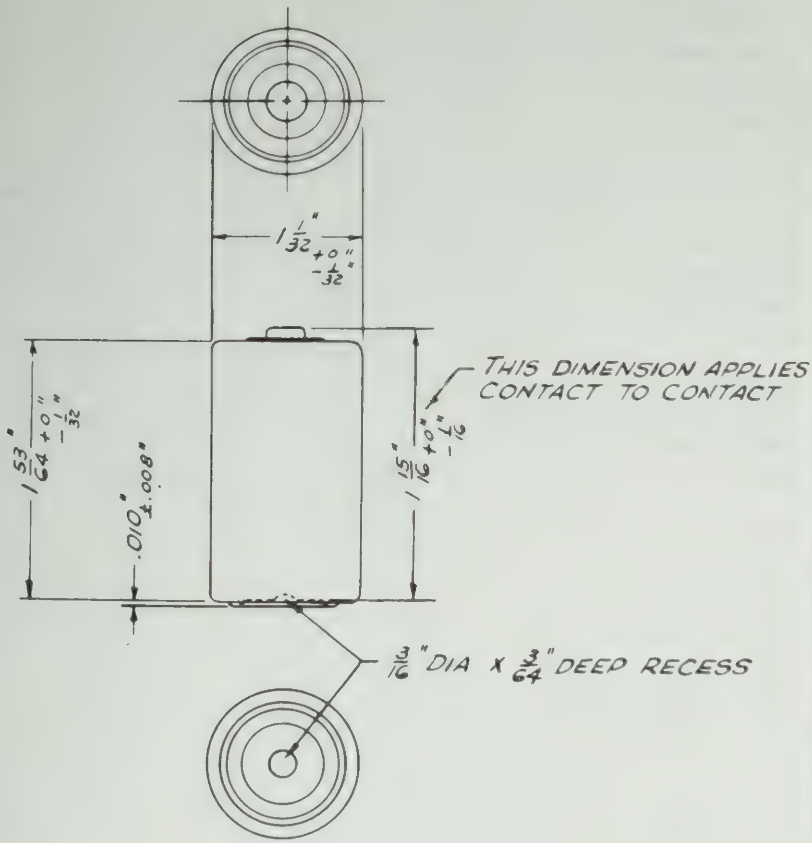
SCHEDULE	STARTING DRAINS	CUT-OFF VOLTAGE				
	(milliamperes)	0.8V	0.9V	1.0V	1.1V	1.2V
2 hrs./day	10	290	285	275	270	250
	20	145	140	135	130	115
	40	72	68	64	60	49
	60	45	43	39	35	27
	100	25	22	19	16	12
	200	8.5	7	6	4	2.5
4 hrs./day	10	295	280	270	260	240
	20	150	145	135	120	110
	40	70	64	60	52	40
	60	43	38	35	29	20
	100	18	16	14.5	12	8
8 hrs./day	10	295	280	255	240	220
	20	150	135	120	110	100
	40	66	60	55	45	34
	60	40	32	28	23	17
12 hrs./day	10	280	265	245	230	200
	20	150	135	120	100	90
	40	58	54	50	40	32
24 hrs./day	10	270	255	230	210	185
	20	117	110	98	88	74
	40	49	45	40	34	28
	60	28	26	23	19	15.5
	100	14	13	11.5	9	7
	200	5	4.5	4	3	2.3

"EVEREADY" NO. 835 CELL

Type — Leclanché

ASA Designation—"C"

Suggested Current Range: 0-80 milliamperes


1 1/32" +0" −1/32"
THIS DIMENSION APPLIES CONTACT TO CONTACT
1 53/64" +0" −1/32"
.010" ±.008"
1 15/16" +0" −1/16"
3/16" DIA X 3/64" DEEP RECESS

SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	1.4 oz.
Volume	1.25 cubic inches
Cell	One No. 35 (ASA "C")

For service information see reverse side of this sheet

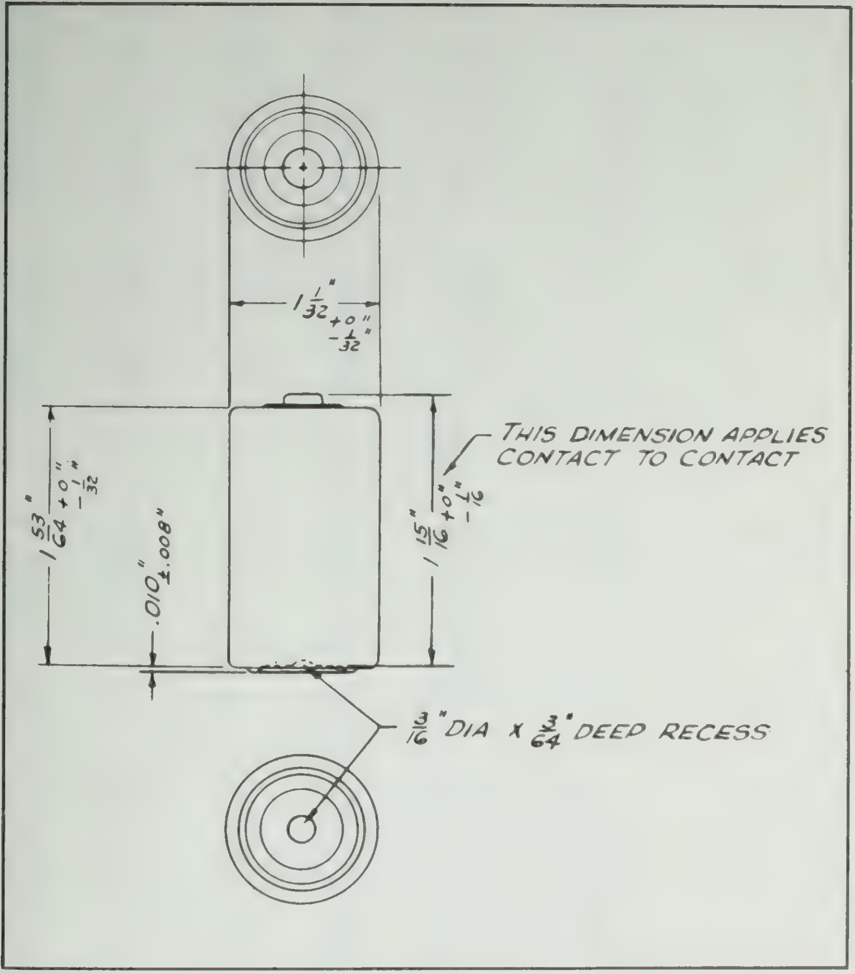
"EVEREADY" NO. 835

Estimated Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 0.25V	CUT-OFF VOLTAGE 0.75V	CUT-OFF VOLTAGE 0.9V
24 hrs./day	375	4		105 min.	
4 min./hr. 8 hrs. /day 16 hrs. rest (Light-Industrial Flashlight Test)	375	4			125 min.
Discharge for 5 min. periods at 24 hr. intervals (Household Intermittent Test)	275	4		250 min.	
Discharge 1 second each minute for 1 hr. at 24 hr. intervals for 5 days per week (ASA Photoflash Test).		0.15	1400 flashes		

"EVEREADY" NO. 935 CELL

Type — Leclanché
ASA Designation—"C"
NEDA Number — 814
Suggested Current Range: 0-80 milliamperes


1 1/32" +0" −1/32"
THIS DIMENSION APPLIES CONTACT TO CONTACT
1 53/64" +0" −1/32"
.010" ±.008"
1 15/16" +0" −1/16"
3/16" DIA X 3/64" DEEP RECESS

SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	1.4 oz.
Volume	1.25 cubic inches
Cell	One No. 35 (ASA "C")

For service information see reverse side of this sheet

"EVEREADY" NO. 935

Estimated Hours Service at 70°F

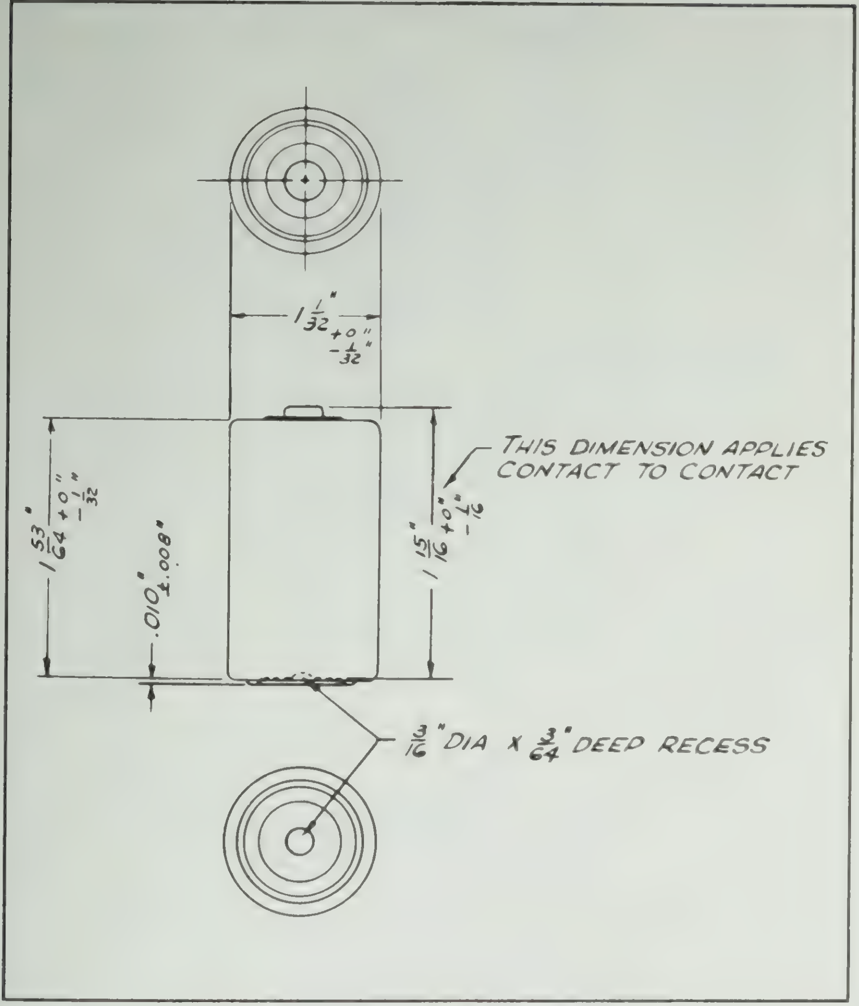
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		0.8V	0.9V	1.0V	1.1V	1.2V
2 hrs./day	2.5	900	850	800	740	680
	5	520	460	420	380	320
	10	275	250	220	190	140
	20	140	130	115	94	64
	30	100	86	74	60	40
	50	53	48	40	33	20
	100	23	20	17	13	7.8
4 hrs./day	2.5	1200	1150	1100	950	820
	5	620	580	540	460	360
	10	310	280	240	210	150
	20	150	130	110	88	62
	30	96	80	68	52	33
	50	52	42	33	25	15
	100	20	14	10	7	3.5
12 hrs./day	2.5	1300	1200	1100	1000	820
	5	650	600	550	480	390
	10	330	300	250	230	180
	20	160	125	110	80	60
	30	90	72	64	44	30
	50	48	38	28	18	11
	100	18	11	8	6	3.5
24 hrs./day	2.5	1450	1300	1200	1000	800
	5	700	620	540	440	340
	10	320	270	220	170	130
	20	140	115	90	64	50
	30	82	68	50	35	26
	50	40	33	23	16.5	11
	100	14	11	8	6	3.5

"EVEREADY" NO. 635 CELL

1.5
Volts

Type — Leclanché

ASA Designation—"C"
NEDA Number — 14
Suggested Current Range: 0-80 milliamperes



1 1/32" +0" −1/32"
1 53/64" +0" −1/32"
.010" ±.008"
1 15/16" +0" −1/16"
THIS DIMENSION APPLIES CONTACT TO CONTACT
3/16" DIA X 3/64" DEEP RECESS

SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	1.4 oz.
Volume	1.25 cubic inches
Cell	One No. 35 (ASA "C")

For service information see reverse side of this sheet

"EVEREADY" NO. 635

Estimated Hours Service at 70°F

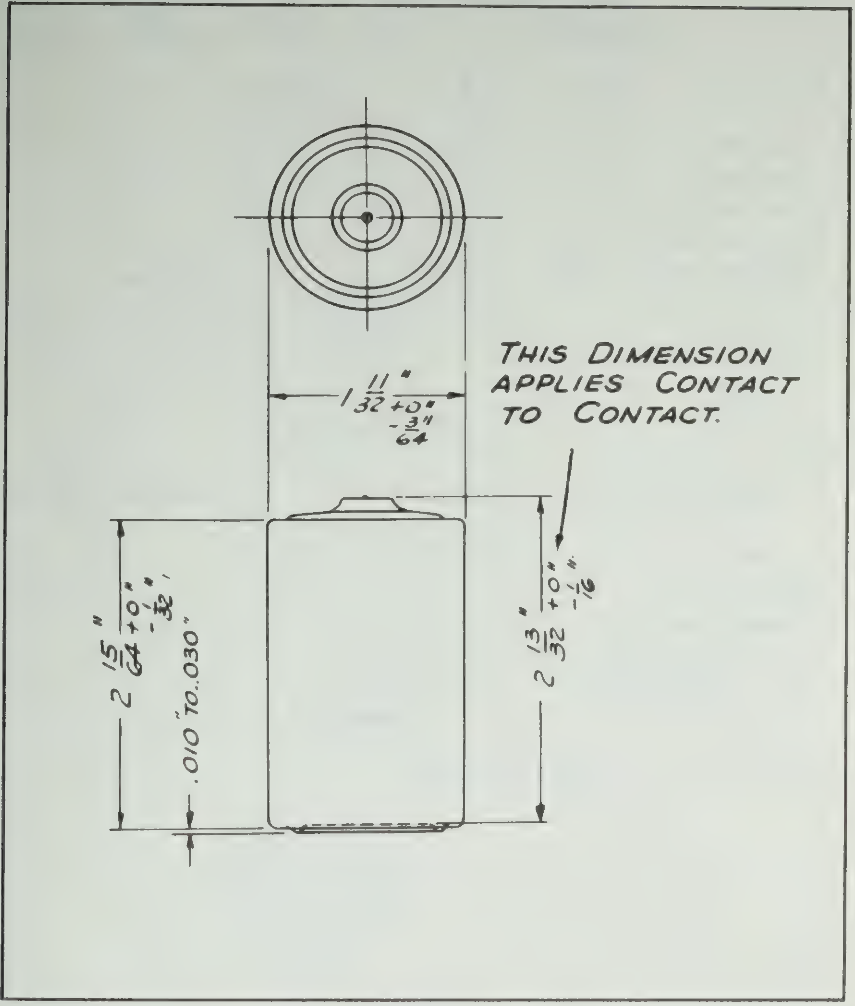
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 1.0V
2 hrs./day	60	25	50 hours
2 hrs./day	80	18.8	32 hours
2 hrs./day	120	12.5	20 hours
2 hrs./day	160	9.4	9 hours

"EVEREADY" NO. 850 CELL

Type — Leclanché

ASA Designation—"D"

Suggested Current Range: 0-150 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	3.3 oz.
Volume	3.17 cubic inches
Cell	One No. 50 (ASA "D")

For service information see reverse side of this sheet

"EVEREADY" NO. 850

Estimated Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 0.5V	0.75V	0.9V	1.1V
24 hrs./day	375	4		325 min.		
4 min./hr. 8 hrs./day 16 hrs. rest (Light-Industrial Flashlight Test)	375	4			420 min.	
4 min. every 15 min. 8 hrs./day 16 hrs. rest (Heavy-Industrial Flashlight Test)	375	4			390 min.	225 min.
1 second each minute for 1 hr. at 24 hr. intervals for 5 days per week (ASA Photoflash Test)		0.15	1700 flashes			

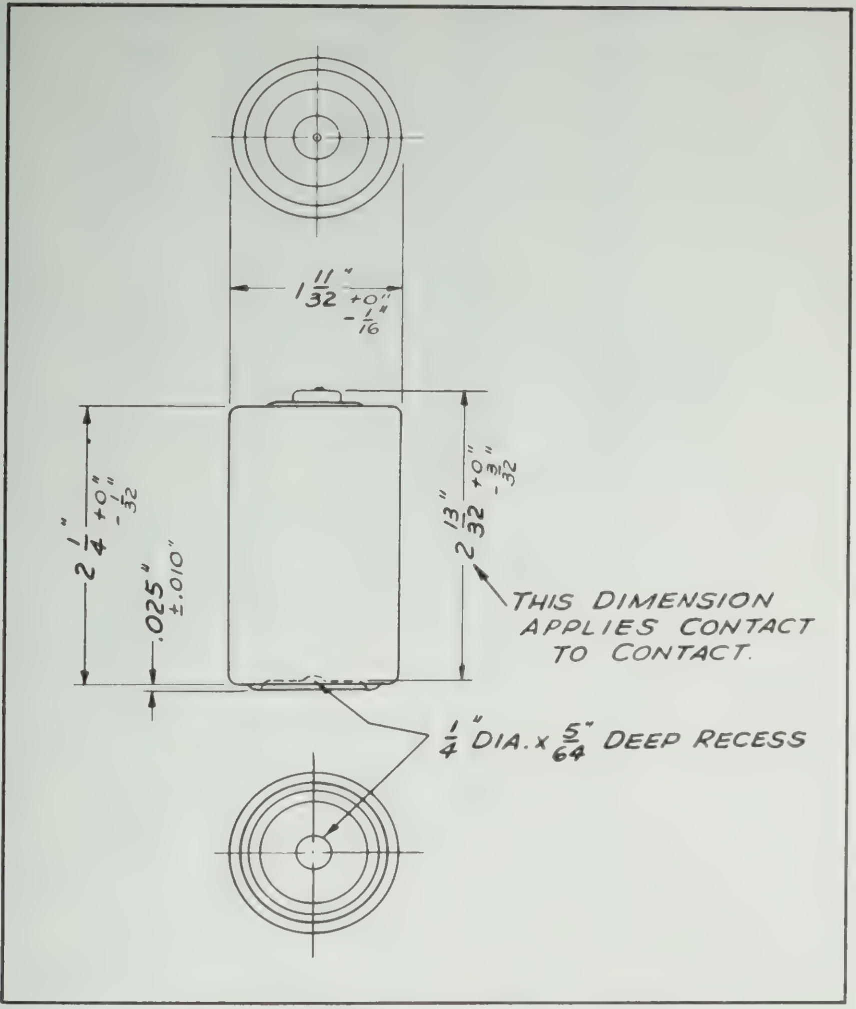
"EVEREADY" NO. 950 CELL

Type — Leclanché

ASA Designation—"D"

NEDA Number — 813

Suggested Current Range: 0-150 milliamperes


1 11/32" +0" -1/16"
2 1/4" +0" -1/32"
.025" ±.010"
2 13/32" +0" -3/32"
THIS DIMENSION APPLIES CONTACT TO CONTACT.
1/4" DIA. x 5/64" DEEP RECESS

SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	3 oz.
Volume	3.19 cubic inches
Cell	One No. 50 (ASA "D")

For service information see reverse side of this sheet

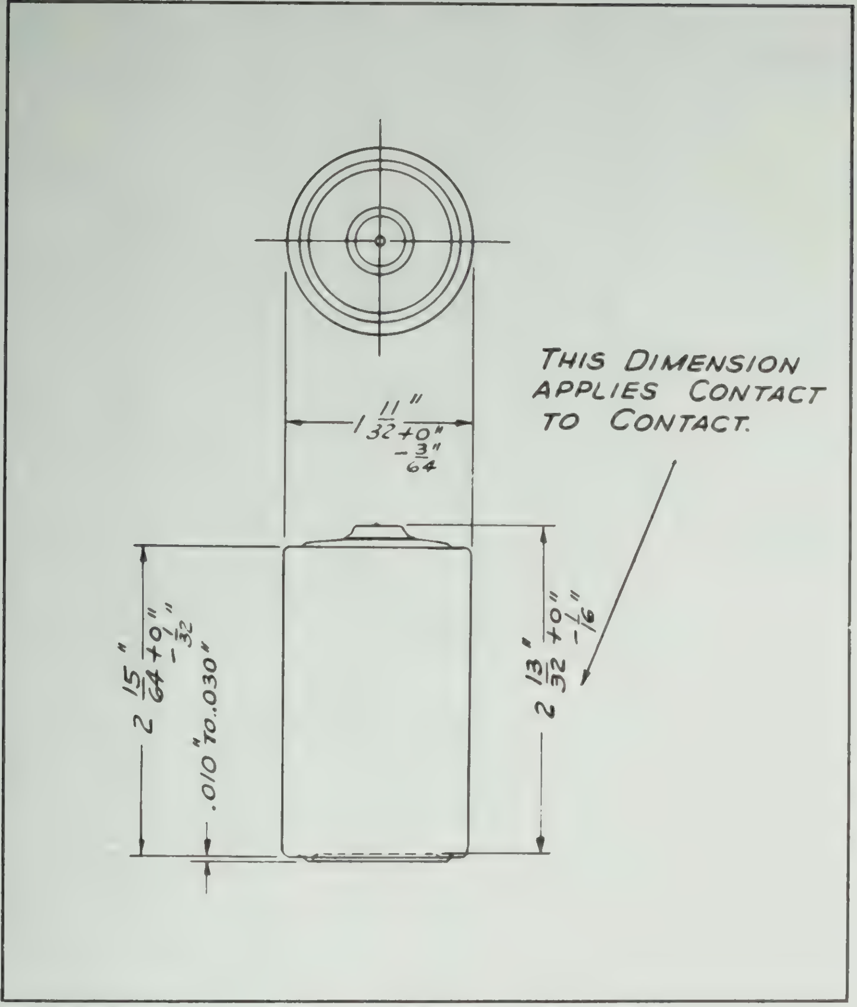
"EVEREADY" NO. 950

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		0.8V	0.9V	1.0V	1.1V	1.2V
2 hrs./day	10	525	500	475	450	430
	20	295	270	260	240	210
	30	210	185	175	155	135
	50	125	113	103	89	77
	100	57	50	45	35	29
	200	21.5	18	15.5	11.5	8
	300	11	8.5	7	5	2
4 hrs./day	10	660	620	580	530	470
	20	330	310	290	260	230
	30	220	200	185	155	125
	50	123	108	96	81	64
	100	50	41	36	30	22
	200	18	13.5	12	9	5.2
	300	8	6	3.5	3	2
8 hrs./day	10	700	660	620	560	460
	20	340	310	270	230	180
	30	210	180	150	130	100
	50	105	82	70	60	50
	100	39	28	23	18	13.5
24 hrs./day	10	1050	745	600	500	370
	20	360	260	210	165	125
	30	200	145	115	88	65
	50	92	67	52	40	29
	100	32	24	18.5	13.5	9.6
	200	11.5	8.4	6.4	4.5	3.2
	300	6	4.5	3.5	3	2

"EVEREADY" NO. D99 CELL

Type — Leclanché
ASA Designation—"D"
NEDA Number — 813
Suggested Current Range: 0-150 milliamperes



THIS DIMENSION APPLIES CONTACT TO CONTACT.

SPECIFICATIONS

Voltage Taps	−, + 1.5
Terminals	Flat Contacts
Average Weight	3.3 oz.
Volume	3.17 cubic inches
Cell	One No. 50 (ASA "D")

For service information see reverse side of this sheet

"EVEREADY" NO. D99

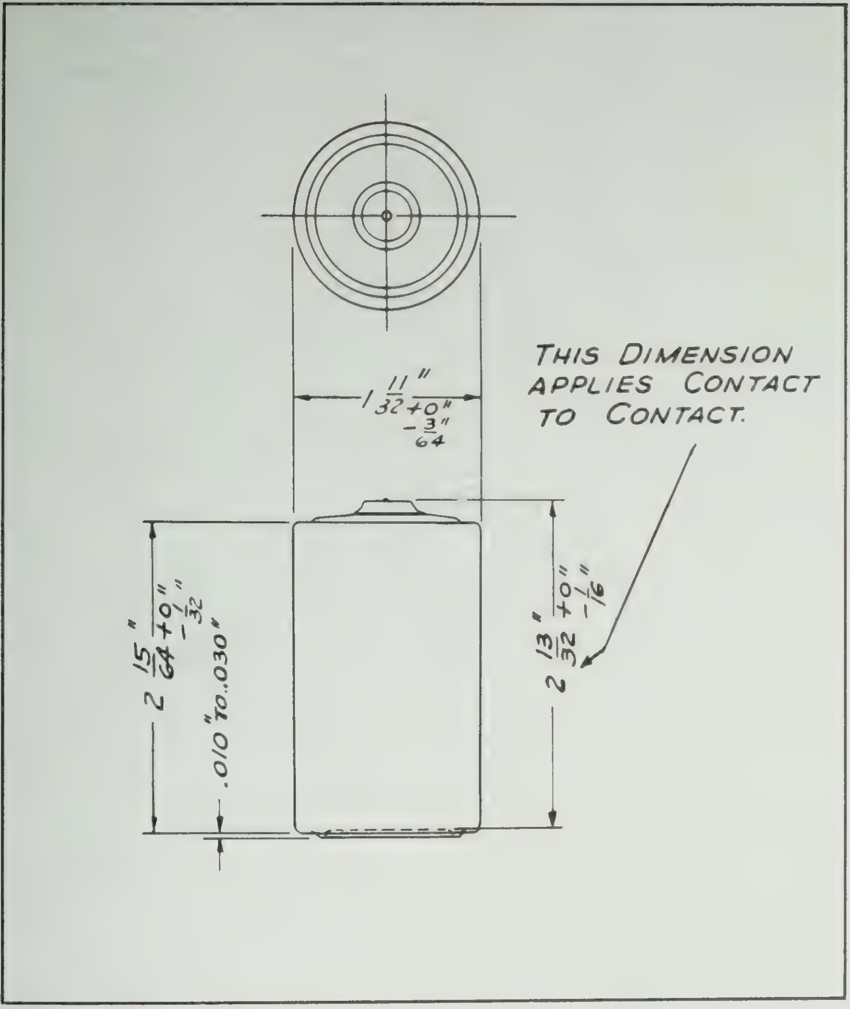
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		0.8V	0.9V	1.0V	1.1V	1.2V
2 hrs./day	20	295	285	270	256	237
	30	200	190	175	165	145
	50	120	115	102	93	78
	100	57	52	45	39	30
	200	23	20	16	12.5	7.5
	300	11	10	6.8	4.2	1.7
4 hrs./day	10	580	560	530	495	385
	20	300	285	260	235	205
	30	190	185	165	150	120
	50	115	97	86	72	57
	100	48	41	34	29	20
	200	18	15	12	9	6
	300	9	6.8	5.2	3.6	1.7
8 hrs./day	10	580	550	515	455	400
	20	300	280	255	220	185
	30	190	180	160	135	109
	50	110	95	82	66	52
	100	45	38	31	27	19
24 hrs./day	10	600	540	495	425	380
	20	285	252	223	200	165
	30	180	157	138	123	100
	50	100	84	72	63	49
	100	43	35	29	25	18
	200	17	13	10.5	8.5	5.2
	300	8.5	6.7	4.8	3.6	1.7

"EVEREADY" NO. A100 CELL

Type — Leclanché

ASA Designation — "D"
NEDA Number — 13
Suggested Current Range: 0-150 milliamperes


$1\frac{11}{32}$" +0" $-\frac{3}{64}$"
THIS DIMENSION APPLIES CONTACT TO CONTACT.
$2\frac{15}{64}$" +0" $-\frac{1}{32}$"
.010" TO .030"
$2\frac{13}{32}$" +0" $-\frac{1}{16}$"

SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	3.3 oz.
Volume	3.17 cubic inches
Cell	One No. 50 (ASA "D")

For service information see reverse side of this sheet

"EVEREADY" NO. A100

Estimated Hours Service at 70°F

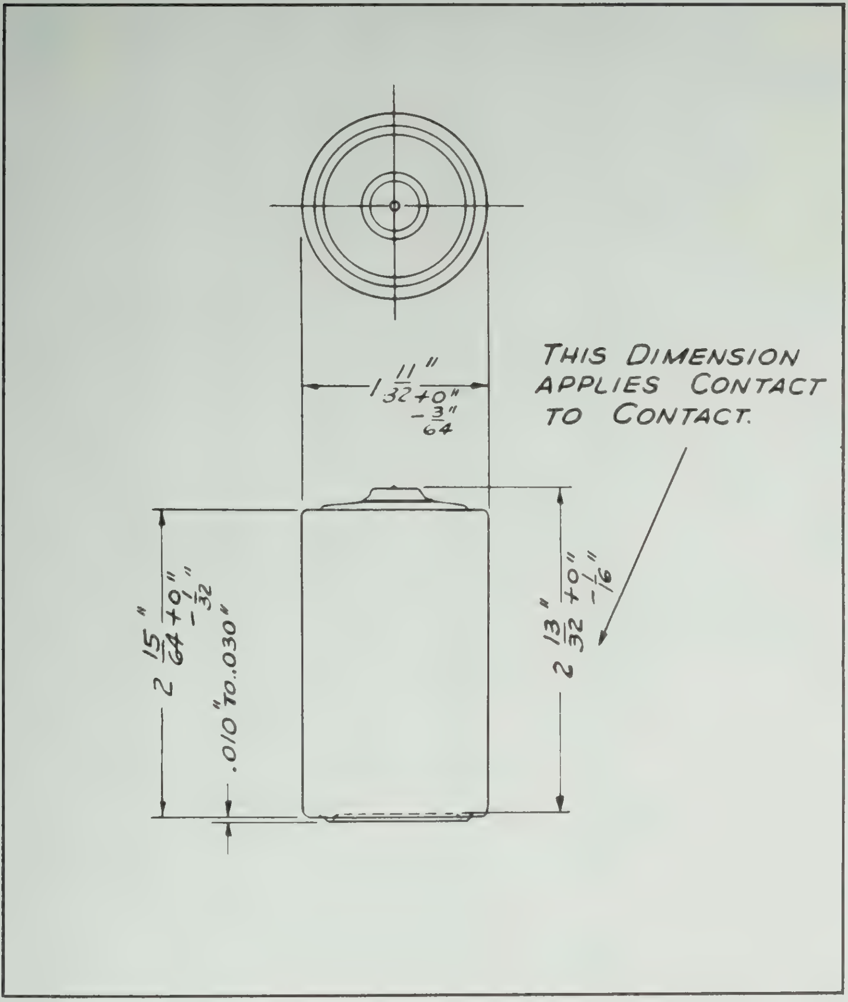
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE
			1.0V
2 hrs./day	60	25	95 hours
2 hrs./day	150	10	30 hours
2 hrs./day	300	5	8.5 hours

"EVEREADY" NO. 1050 CELL

Type — Leclanché

ASA Designation—"D"

Suggested Current Range: 0-150 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	3.3 oz.
Volume	3.17 cubic inches
Cell	One No. 50 (ASA "D")

For service information see reverse side of this sheet

"EVEREADY" NO. 1050

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 0.8V	0.9V	1.0V	1.1V	1.2V
2 hrs./day	20	320	310	300	290	270
	50	150	145	140	135	125
	100	76	72	68	60	48
	200	36	32	28	18.5	11
	300	22	18	13.5	7	4
	500	8.7	5.5	3.5	1.8	0.8
4 hrs./day	10	725	700	680	660	640
	20	385	375	360	350	330
	50	150	145	135	130	110
	100	70	62	58	54	38
	200	28	23	20	15	10
	300	16	12	9.5	6.5	3
8 hrs./day	10	760	750	740	700	660
	20	385	375	360	340	310
	50	150	140	135	120	105
24 hrs./day	5	1625	1550	1525	1450	1350
	10	820	770	750	700	650
	20	410	390	360	340	300
	50	150	135	125	110	100
	100	67	59	52	42	35
	200	25	21	18	13	9
	300	13	10	8.5	6	3
	500	4	3.5	3	1.8	0.8

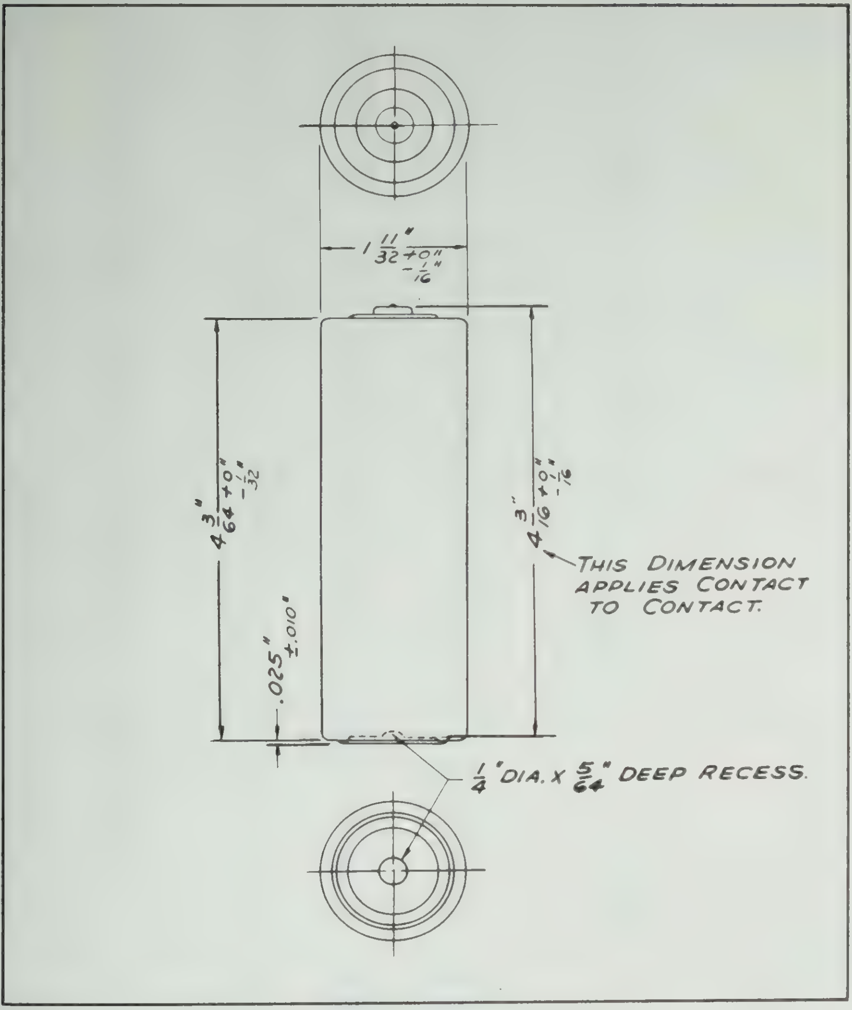
"EVEREADY" NO. 964 CELL

Type — Leclanché

ASA Designation—"G"

NEDA Number—20

Suggested Current Range: 0-300 milliamperes


1 11/32" +0" −1/16"
4 3/64" +0" −1/32"
4 3/16" +0" −1/16"
THIS DIMENSION APPLIES CONTACT TO CONTACT.
.025" ±.010"
1/4" DIA. X 5/64" DEEP RECESS.

SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	5.9 oz.
Volume	4.92 cubic inches
Cell	One No. 64 (ASA "G")

For service information see reverse side of this sheet

"EVEREADY" NO. 964

Estimated Hours Service at 70°F

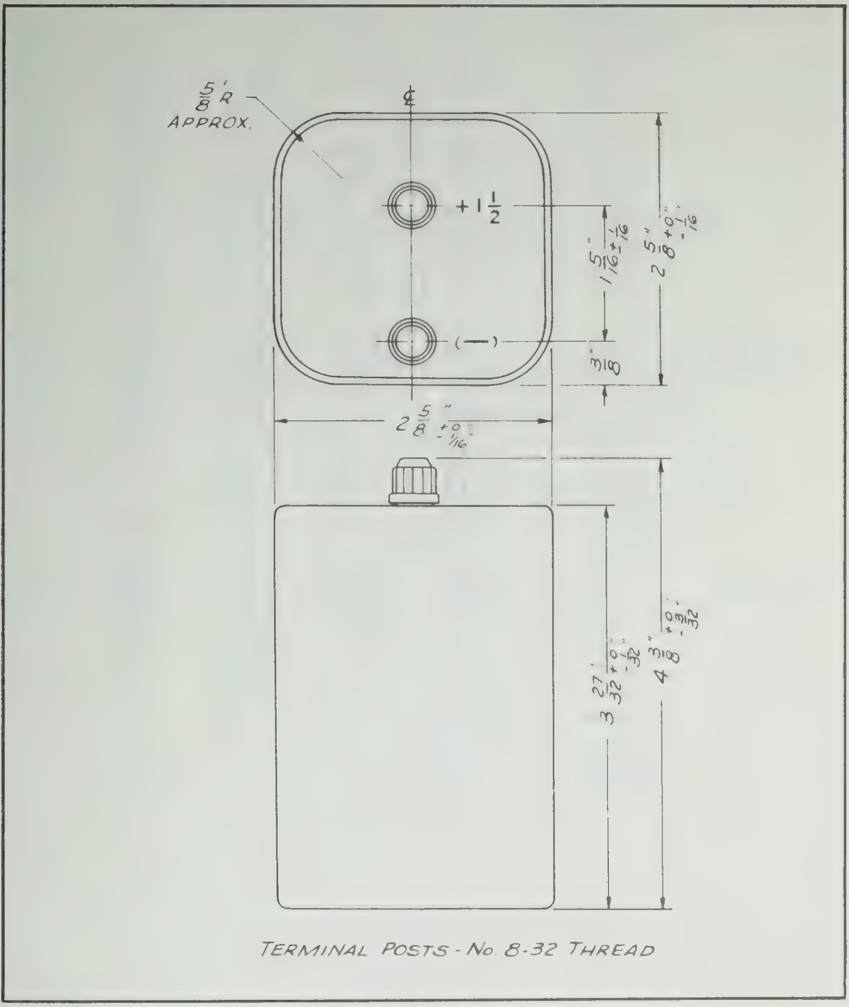
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		0.8V	0.9V	1.0V	1.1V	1.2V
2 hrs./day	10	1400	1300	1200	1150	1060
	20	720	680	620	580	510
	30	480	440	410	380	360
	100	135	115	105	96	86
	200	52	47	44	39	33
	300	29	26	23	20	17
	500	13.5	12	10.5	8	6.5
4 hrs./day	10	1500	1400	1300	1200	1100
	20	790	700	650	590	520
	30	520	460	420	380	330
	100	130	110	94	84	70
	200	47	42	35	31	22
	300	26.5	23	18.5	16.2	10.5
	500	11.5	9.3	7.2	6	3
8 hrs./day	5	3200	3100	3000	2800	2500
	10	1700	1650	1600	1400	1200
	20	850	800	740	640	520
	30	530	480	430	380	310
	50	275	250	220	190	150
	100	110	96	80	65	54
	200	42	34	26	21	16
	300	19	14	12.5	7	4.8
12 hrs./day	5	3300	3200	3100	2900	2550
	10	1750	1700	1550	1350	1150
	20	860	760	690	580	495
	30	520	450	400	340	285
	50	265	230	190	165	135
	100	100	88	70	54	42
	200	38	30	21	16	10
	300	16	12.5	10.5	7	4.8
24 hrs./day	5	3700	3500	3300	3000	2450
	10	1800	1600	1450	1250	1000
	20	800	700	600	500	380
	30	500	420	350	285	215
	50	265	220	180	140	100
	100	90	78	66	47	32
	200	31	25	20	13.5	10
	300	15	12	10.5	7	4.8

"EVEREADY" NO. 735 BATTERY

Type — Leclanché

NEDA Number—900

Suggested Current Range: 0-1000 milliamperes



TERMINAL POSTS - No. 8-32 THREAD

SPECIFICATIONS

Voltage Taps..—, + 1.5
Terminals..Plastic Knurls
Average Weight...1 lb. 7 oz.
Volume...26.5 cubic inches
Cells.......................................Four No. 60 (ASA "F") in parallel

For service information see reverse side of this sheet

"EVEREADY" NO. 735

Estimated Hours Service at 70°F

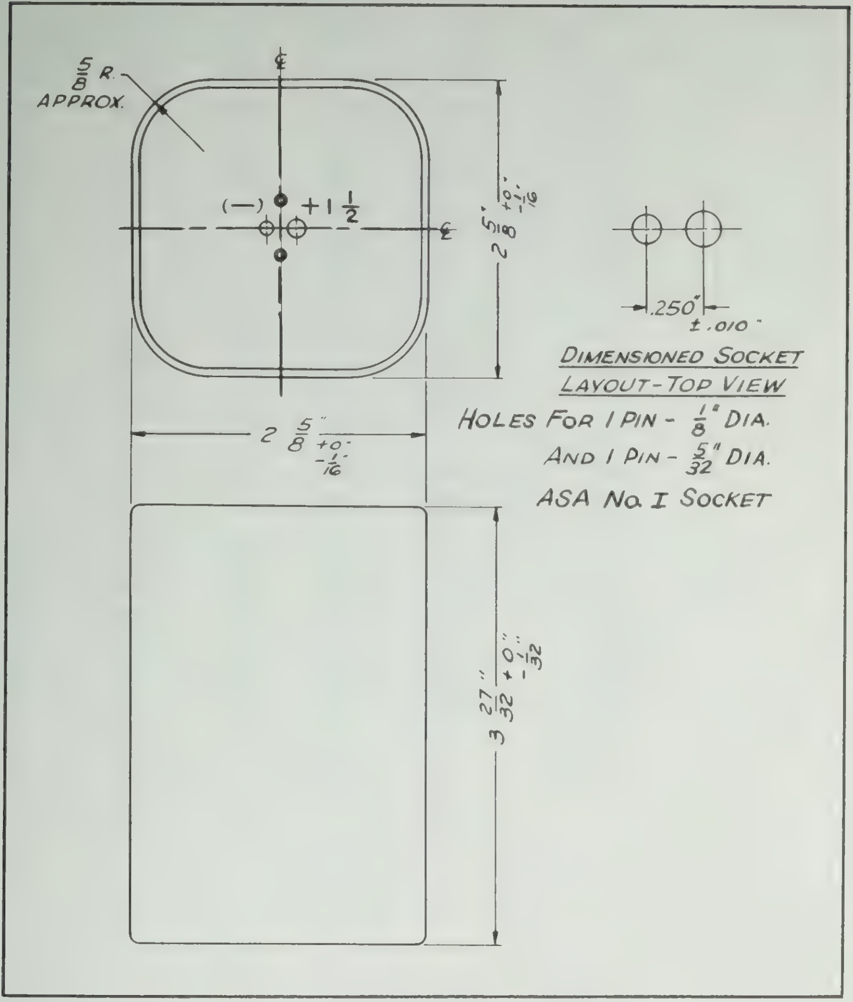
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		0.8V	0.9V	1.0V	1.1V	1.2V
2 hrs./day	20	1650	1550	1450	1400	1300
	40	900	840	780	720	640
	80	490	450	410	370	310
	120	340	310	280	250	200
	400	98	88	78	68	47
	800	41	37	33	27	16
	1200	23	20.5	18	13.8	6.8
4 hrs./day	40	940	880	840	760	680
	80	475	425	400	335	300
	120	320	275	260	235	180
	400	90	75	56	44	36
	800	35	28	22	16	12
	1200	19	15	12.3	8.5	4
24 hrs./day	20	2450	2350	2200	2000	1450
	40	1200	1050	940	880	620
	80	550	470	390	335	260
	120	350	275	250	220	155
	400	84	70	55	40	25
	800	33	26	20	13	8
	1200	18	14	10.5	6.5	4

"EVEREADY" NO. 742 BATTERY

Type — Leclanché

NEDA Number—4

Suggested Current Range: 0-1000 milliamperes



SPECIFICATIONS

Voltage Taps	–, + 1.5
Terminals	Socket
Average Weight	1 lb. 6 oz.
Volume	26.5 cubic inches
Cells	Four No. 60 (ASA "F") in parallel

For service information see reverse side of this sheet

"EVEREADY" NO. 742

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 0.8V	0.9V	1.0V	1.1V	1.2V
2 hrs./day	20	1650	1550	1450	1400	1300
	40	900	840	780	720	640
	80	490	450	410	370	310
	120	340	310	280	250	200
	400	98	88	78	68	47
	800	41	37	33	27	16
	1200	23	20.5	18	13.8	6.8
4 hrs./day	40	940	880	840	760	680
	80	475	425	400	335	300
	120	320	275	260	235	180
	400	90	75	56	44	36
	800	35	28	22	16	12
	1200	19	15	12.3	8.5	4
24 hrs./day	20	2450	2350	2200	2000	1450
	40	1200	1050	940	880	620
	80	550	470	390	335	260
	120	350	275	250	220	155
	400	84	70	55	40	25
	800	33	26	20	13	8
	1200	18	14	10.5	6.5	4

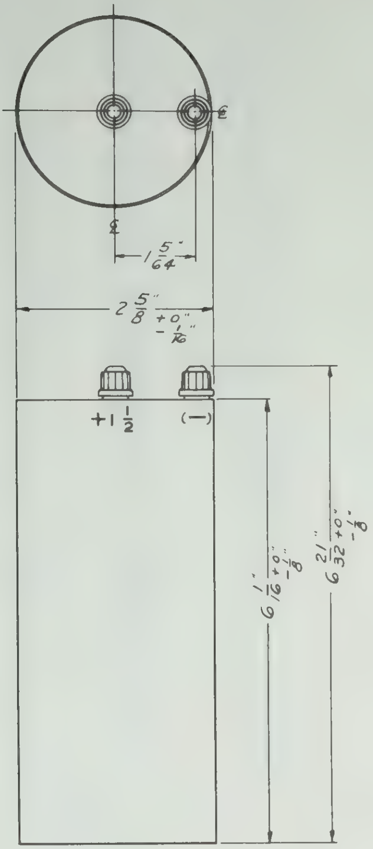
"EVEREADY" NO. 6 "IGNITOR" CELL

Type — Leclanché

ASA Designation—"6"

NEDA Numbers — 905 and 914

Suggested Current Range: 0-1500 milliamperes



TERMINAL POSTS - No. 8-32 THREAD

SPECIFICATIONS

Voltage Taps..........—, + 1.5
Terminals..........Plastic Knurls or Fahnestock
Average Weight..........2 lbs. 1 oz.
Volume..........29.3 cubic inches
Cell..........One No. 6 (ASA "6")

For service information see reverse side of this sheet

"EVEREADY" NO. 6 "IGNITOR"

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 0.8V	0.9V	1.0V	1.1V	1.2V
2 hrs./day	60	651	641	610	591	565
	70	590	580	540	520	475
	80	540	530	480	460	410
	100	460	450	400	370	320
	200	265	250	210	185	135
	300	176	157	133	112	76
	400	130	110	94	74	48
	600	75	64	54	37	20
4 hrs./day	60	817	760	713	665	540
	70	720	660	600	550	450
	80	640	580	520	480	390
	100	530	470	410	370	300
	200	275	230	185	160	115
	300	166	143	114	92	63
	400	125	100	78	60	40
	600	68	55	43	32	20
8 hrs./day	20	2300	2250	2150	2050	2000
	40	1300	1250	1200	1100	1000
	60	950	890	817	722	627
	70	820	760	700	620	525
	80	720	680	620	530	450
	100	590	540	490	415	330
	200	290	260	225	180	120
	300	176	157	128	100	60
	400	114	98	82	60	34
	600	50	44	35	25	11
24 hrs./day	10	5100	5000	4800	4600	4300
	20	3000	2800	2700	2500	2250
	40	1550	1450	1350	1200	960
	60	1078	980	868	726	566
	70	850	780	700	580	440
	80	720	660	600	480	350
	100	550	500	450	350	260
	200	210	190	170	125	74
	300	114	99	90	66	35
	400	74	65	55	40	20
	600	39	33	29	20	9

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 0.85V	0.93V
1 hr. discharge, 6 hr. rest, 1 hr. discharge, 16 hr. rest (Heavy Intermittent Test)	562	2.67	90 hrs.	
Discharge for 10 periods of 4 min. each, beginning at hourly intervals, during 6 days per week. On the remaining day, every other discharge period shall be omitted. (There are 65 such discharge periods per week or a total weekly service of 260 minutes.) (Light Intermittent Test)	225	6.67		300 days

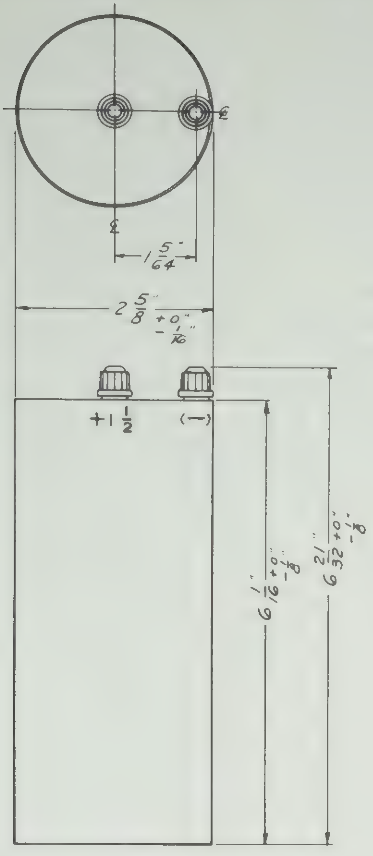
"EVEREADY" NO. 6 "GRAY LABEL" CELL

Type — Leclanché

ASA Designation—"6"

NEDA Number—906

Suggested Current Range: 0-1500 milliamperes



TERMINAL POSTS - No. 8-32 THREAD

SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Fahnestock or Plastic Knurls
Average Weight	2 lbs. 1 oz.
Volume	29.3 cubic inches
Cell	One No. 6 (ASA "6")

For service information see reverse side of this sheet

"EVEREADY" NO. 6 "GRAY LABEL"

Estimated Service at 70°F

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 0.93V
Discharge for 10 periods of 4 min. each beginning at hourly intervals, during 6 days per week. On the remaining day every other discharge period shall be omitted. (There are 65 such discharge periods per week, or a total weekly service of 260 minutes) (Light Intermittent Test)	225	6.67	375 days

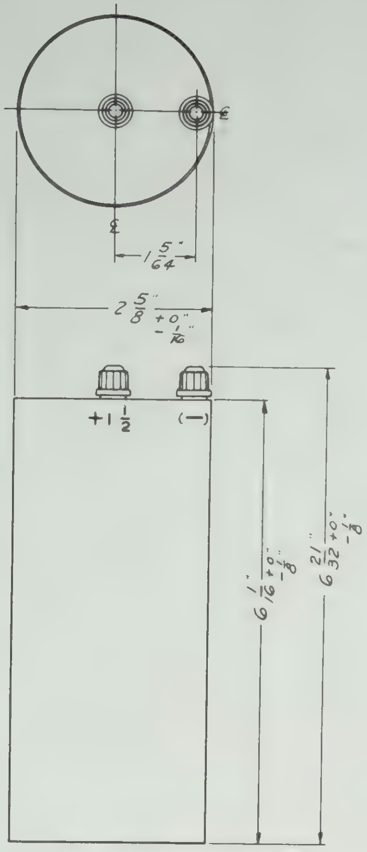
"EVEREADY" NO. 6 RAILROAD & INDUSTRIAL CELL

Type — Leclanché

ASA Designation—"6"

NEDA Number—911

Suggested Current Range: 0-1500 milliamperes



TERMINAL POSTS - No. 8-32 THREAD

SPECIFICATIONS

Voltage Taps.......—, + 1.5
Terminals.......Plastic Knurls or Fahnestock
Average Weight.......2 lbs. 1 oz.
Volume.......29.3 cubic inches
Cell.......One No. 6 (ASA "6")

For service information see reverse side of this sheet

"EVEREADY" NO. 6 RAILROAD & INDUSTRIAL

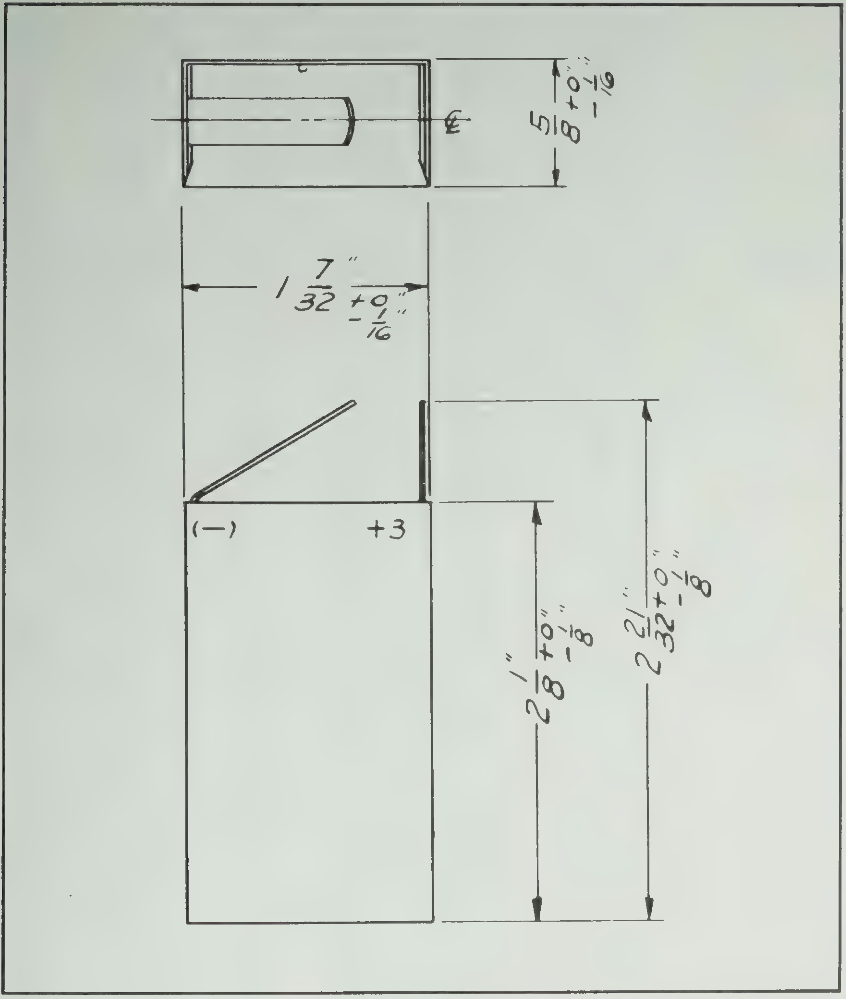
Estimated Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE		
			0.85V	0.93V	1.08V
1 hr. discharge 6 hr. rest 1 hr. discharge 16 hr. rest (Heavy Intermittent Test)	562	2.67	105 hrs.		
Discharge for 10 periods of 4 min. each beginning at hourly intervals, during 6 days per week. On the remaining day, every other discharge period shall be omitted. (There are 65 such discharge periods per week, or a total weekly service of 260 minutes) (Light Intermittent Test)	225	6.67		375 days	
As immediately above	90	16.67			650 days

"EVEREADY" NO. 750 BATTERY

Type — Leclanché

Suggested Current Range: 0-25 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 3
Terminals	Spring
Average Weight	2 oz.
Volume	1.62 cubic inches
Cells	Two No. 15 (ASA "AA") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 750

Estimated Hours Service at 70°F

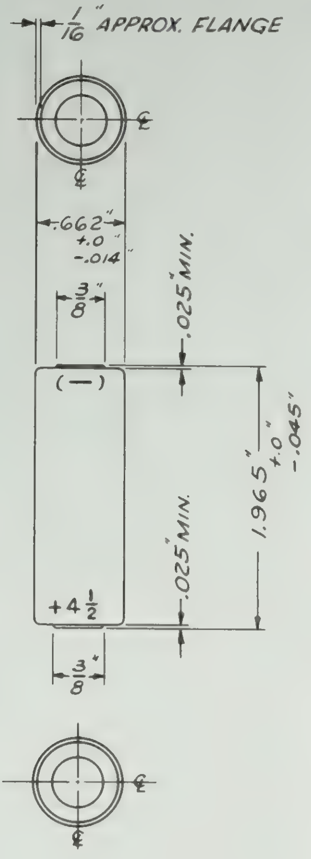
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 1.6V	1.8V	2.0V	2.2V	2.4V
2 hrs./day	5	265	255	240	210	145
	10	125	120	110	92	60
	20	54	50	46	36	22
	30	32	28	25	20	11
	50	14	12	10	8	3.8
4 hrs./day	5	260	250	230	200	130
	10	120	110	98	84	54
	20	48	43	37	30	18
	30	26	22	18	14	7.6
8 hrs./day	1	1275	1190	1080	950	680
	2	620	560	500	420	300
	5	240	225	200	160	105
	10	110	94	78	64	42
	20	42	35	28	21	14
	30	22	18	15	10.5	6.7
12 hrs./day	1	1420	1280	1210	1120	820
	2	700	640	600	510	360
	5	230	215	180	140	100
	10	100	84	74	60	37
	20	40	33	26	19	11
24 hrs./day	1	1440	1250	1180	1040	700
	2	670	580	500	420	300
	5	220	200	160	130	90
	10	94	80	66	52	35
	20	37	30	25	19	11
	30	20	16	13	9	6.7
	50	10	8.5	6.8	4.8	2.8

"EVEREADY" NO. 333 BATTERY

Type — Leclanché

NEDA Number — 1306

Suggested Current Range: 0-12 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 4.5
Terminals	Flat Contacts
Average Weight	0.9 oz.
Volume	0.65 cubic inches
Cells	Six No. 108—Two parallel strings of three in series

For service information see reverse side of this sheet

"EVEREADY" NO. 333

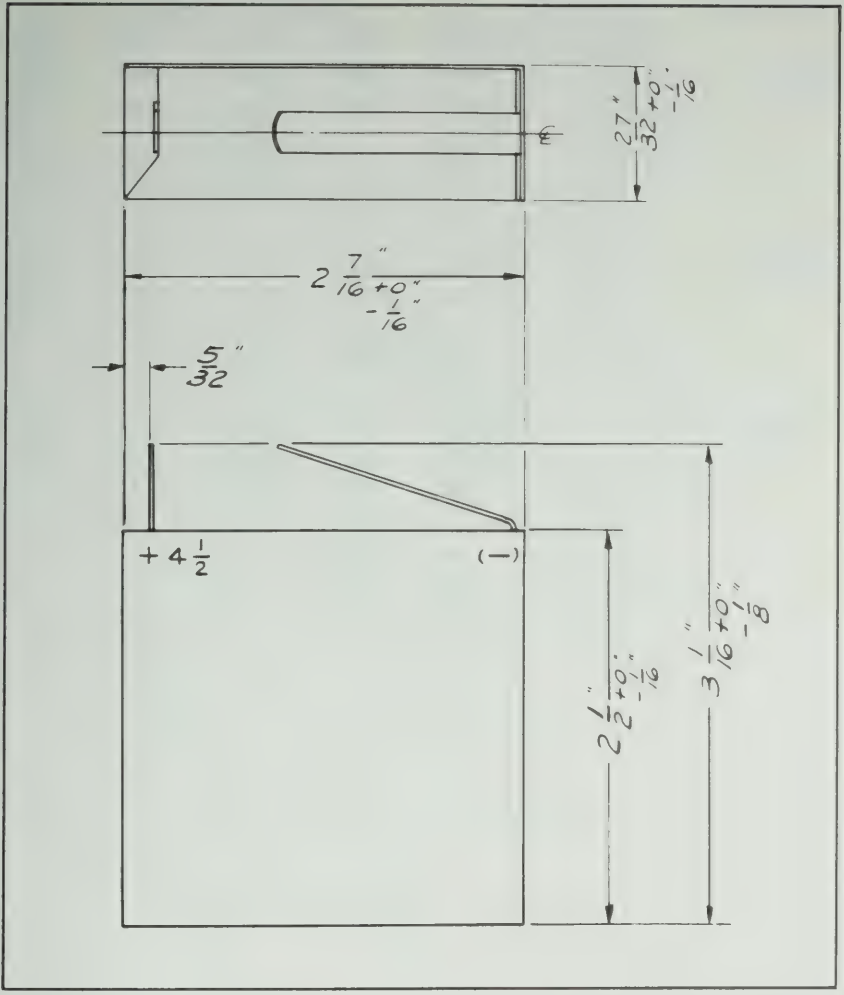
Estimated Hours Service at 70°F (Tentative)

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE		
			2.4V	3.0V	3.3V
2 hrs./day	12	375	46	37	30
	20	225	24.5	17.1	12.4
	30	150	15	8.3	5.2

"EVEREADY" NO. 703 BATTERY

Type — Leclanché

Suggested Current Range: 0-50 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 4.5
Terminals	Spring
Average Weight	5 oz.
Volume	5.1 cubic inches
Cells	Three No. 30 (ASA "B") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 703

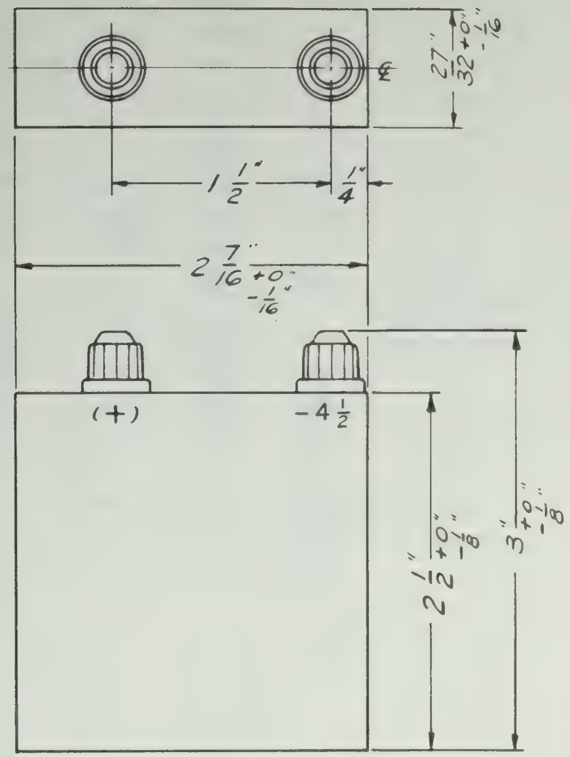
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 2.4V	2.7V	3.0V	3.3V	3.6V
2 hrs./day	5	420	380	340	290	250
	10	220	190	155	130	107
	20	110	90	75	57	45
	50	37	30	24	18	13.5
	100	14.5	11.5	9	6.2	4.5
4 hrs./day	5	480	450	410	330	265
	10	240	215	190	150	100
	20	110	90	75	55	40
	50	28	22	18.5	14	7
24 hrs./day	1	3040	2990	2920	2600	1850
	5	610	530	440	390	300
	10	205	170	130	110	80
	20	87	70	50	37	27
	50	26	20	13	9	6
	100	10	7.5	4.5	3	2.2
	300	1.9	1.3	0.7	0.3	0.1

"EVEREADY" NO. 781 BATTERY

Type — Leclanché

Suggested Current Range: 0-50 milliamperes



TERMINAL POSTS- No. 8-32 THREAD

SPECIFICATIONS

Voltage Taps	+, — 4.5
Terminals	Plastic Knurls
Average Weight	5 oz.
Volume	5.1 cubic inches
Cells	Three No. 30 (ASA "B") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 781

Estimated Hours Service at 70°F

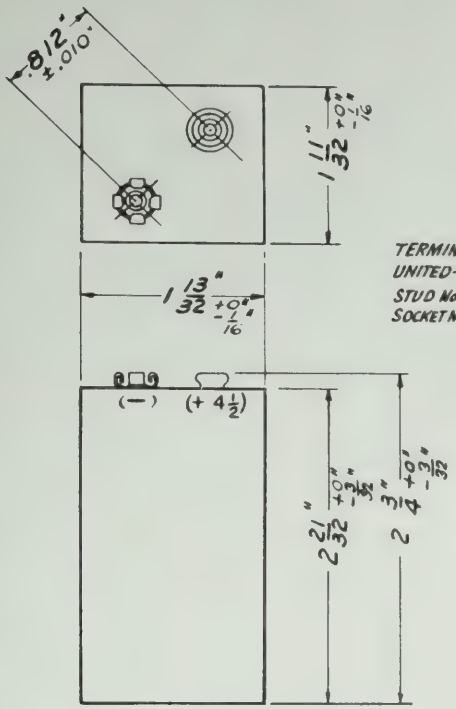
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 2.4V	2.7V	3.0V	3.3V	3.6V
2 hrs./day	5	420	380	340	290	250
	10	220	190	155	130	107
	20	110	90	75	57	45
	50	37	30	24	18	13.5
	100	14.5	11.5	9	6.2	4.5
4 hrs./day	5	480	450	410	330	265
	10	240	215	190	150	100
	20	110	90	75	55	40
	50	28	22	18.5	14	7
24 hrs./day	1	3040	2990	2920	2600	1850
	5	610	530	440	390	300
	10	205	170	130	110	80
	20	87	70	50	37	27
	50	26	20	13	9	6
	100	10	7.5	4.5	3	2.2
	300	1.9	1.3	0.7	0.3	0.1

"EVEREADY" NO. 243 BATTERY

Type — Leclanché

NEDA Number—1610

Suggested current range: 0-40 milliamperes



TERMINALS: MINIATURE SNAP
UNITED-CARR FASTENER CORP.
STUD No.- BS 52719 (POSITIVE)
SOCKET No.- HS 52784 (NEGATIVE)

SPECIFICATIONS

Voltage Taps	—, + 4.5
Terminals	Miniature Snap
Average Weight	4.5 oz.
Volume	5.02 cubic inches
Cells	Six No. 146—Two parallel strings of three in series

For service information see reverse side of this sheet

"EVEREADY" NO. 243

Estimated Hours Service at 70°F

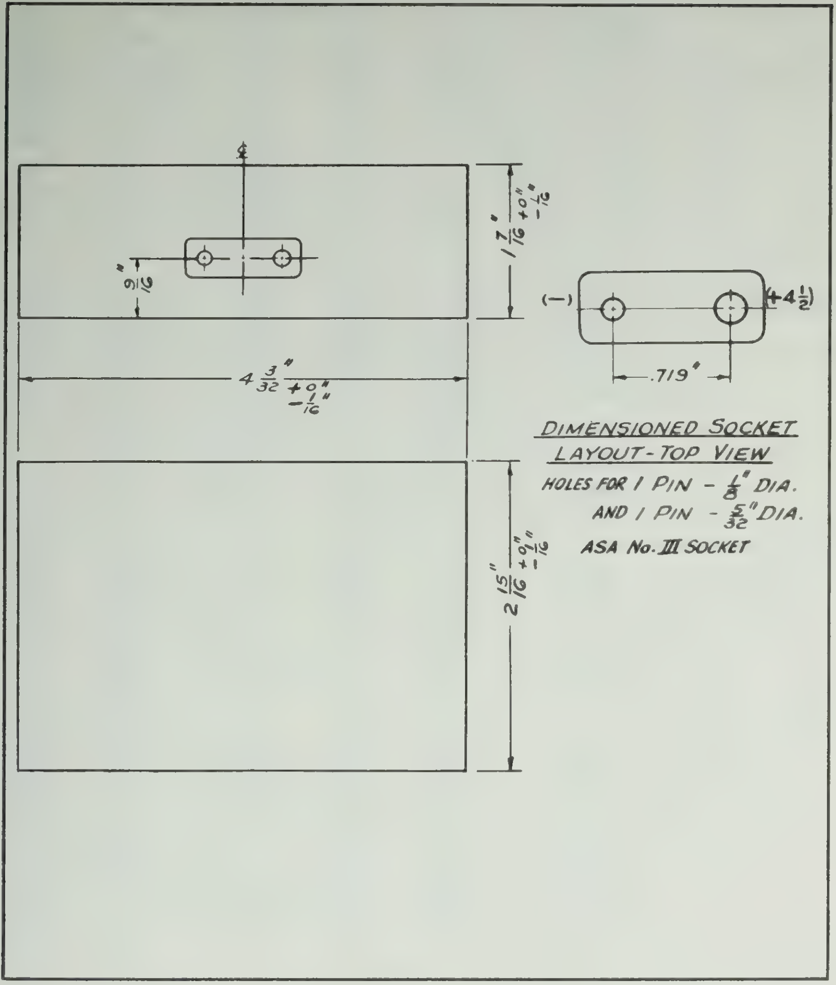
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE	
			2.4V	3.0V
2 hrs./day	20	225	130 hrs.	100 hrs.

"EVEREADY" NO. 726 BATTERY

Type — Leclanché

NEDA Number—19

Suggested Current Range: 0-150 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 4.5
Terminals	Socket
Average Weight	10.5 oz.
Volume	15.2 cubic inches
Cells	Three No. 50 (ASA "D") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 726

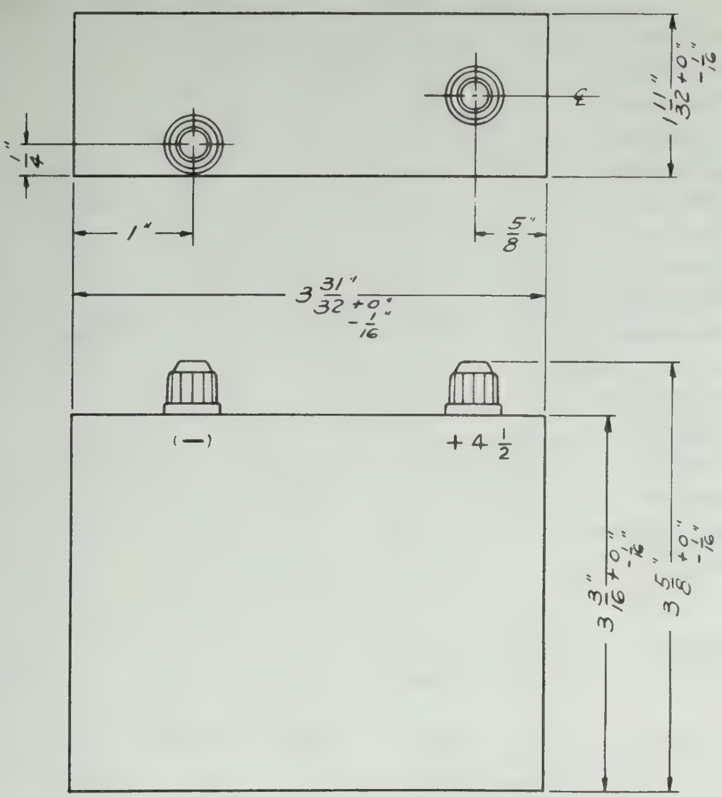
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		2.4V	2.7V	3.0V	3.3V	3.6V
2 hrs./day	20	295	285	270	256	237
	30	200	190	175	165	145
	50	120	115	102	93	78
	100	57	52	45	39	30
	200	23	20	16	12.5	7.5
	300	11	10	6.8	4.2	1.7
4 hrs./day	10	580	560	530	495	385
	20	300	285	260	235	205
	30	190	185	165	150	120
	50	115	97	86	72	57
	100	48	41	34	29	20
	200	18	15	12	9	6
	300	9	6.8	5.2	3.6	1.7
8 hrs./day	10	580	550	515	455	400
	20	300	280	255	220	185
	30	190	180	160	135	109
	50	110	95	82	66	52
	100	45	38	31	27	19
24 hrs./day	10	600	540	495	425	380
	20	285	252	223	200	165
	30	180	157	138	123	100
	50	100	84	72	63	49
	100	43	35	29	25	18
	200	17	13	10.5	8.5	5.2
	300	8.5	6.7	4.8	3.6	1.7

"EVEREADY" NO. 714 BATTERY

Type — Leclanché

Suggested Current Range: 0-200 milliamperes



TERMINAL POSTS - No. 8-32 THREAD

SPECIFICATIONS

Voltage Taps...—, + 4.5
Terminals...Plastic Knurls
Average Weight...14.5 oz.
Volume...16.9 cubic inches
Cells..Three No. 55 (ASA "E") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 714

Estimated Service at 70°F

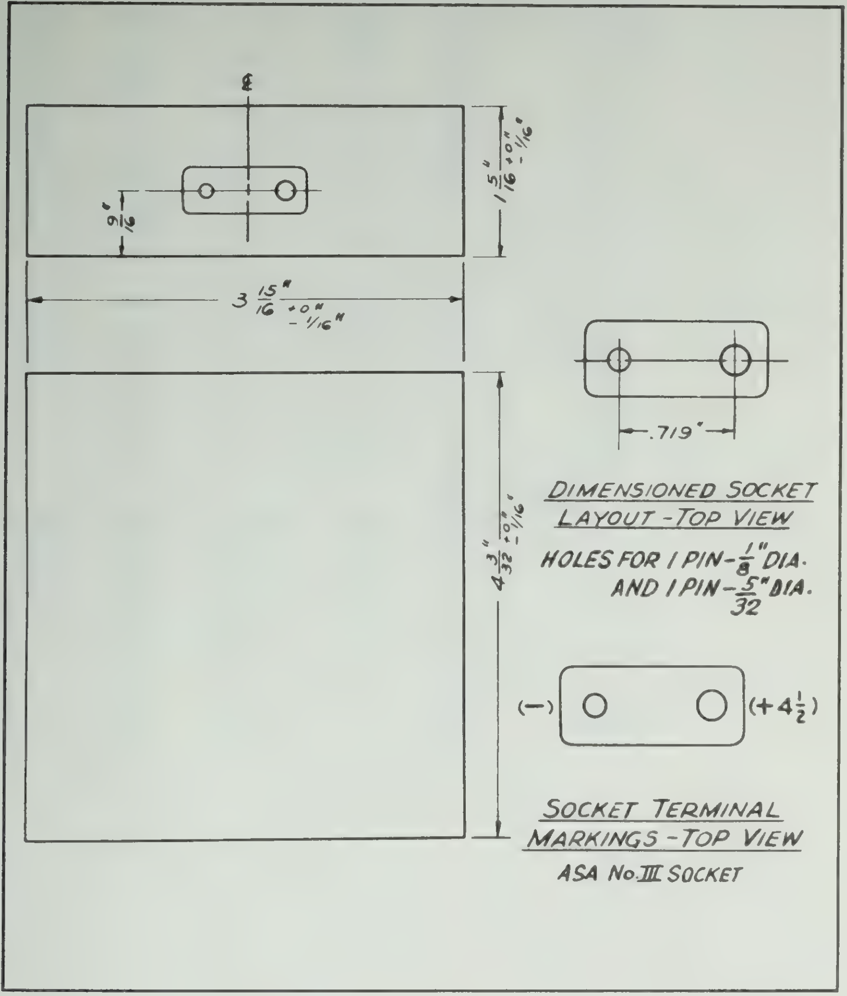
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE		
			2.7V	2.8V	3.25V
Discharge for 10 periods of 4 min. each beginning at hourly intervals, during 6 days per week. On the remaining day every other discharge period shall be omitted. (There are 65 such discharge periods per week, or a total weekly service of 260 minutes) (Light Intermittent Test)	225	20		60 days	
Schedule as above	90	50			110 days
6 hrs./day	120	37.5	85 hrs.		

"EVEREADY" NO. 736 BATTERY

Type — Leclanché

NEDA Number—3

Suggested Current Range: 0-250 milliamperes


℄
9/16"
1 5/16" +0" −1/16"
3 15/16" +0" −1/16"
4 3/32" +0" −1/16"
.719"
DIMENSIONED SOCKET LAYOUT - TOP VIEW
HOLES FOR 1 PIN - 1/8" DIA. AND 1 PIN - 5/32" DIA.
(−)
(+4½)
SOCKET TERMINAL MARKINGS - TOP VIEW
ASA No. III SOCKET

SPECIFICATIONS

Voltage Taps	−, + 4.5
Terminals	Socket
Average Weight	1 lb.
Volume	21.1 cubic inches
Cells	Three No. 60 (ASA "F") in series

"EVEREADY" NO. 736

Estimated Hours Service at 70°F

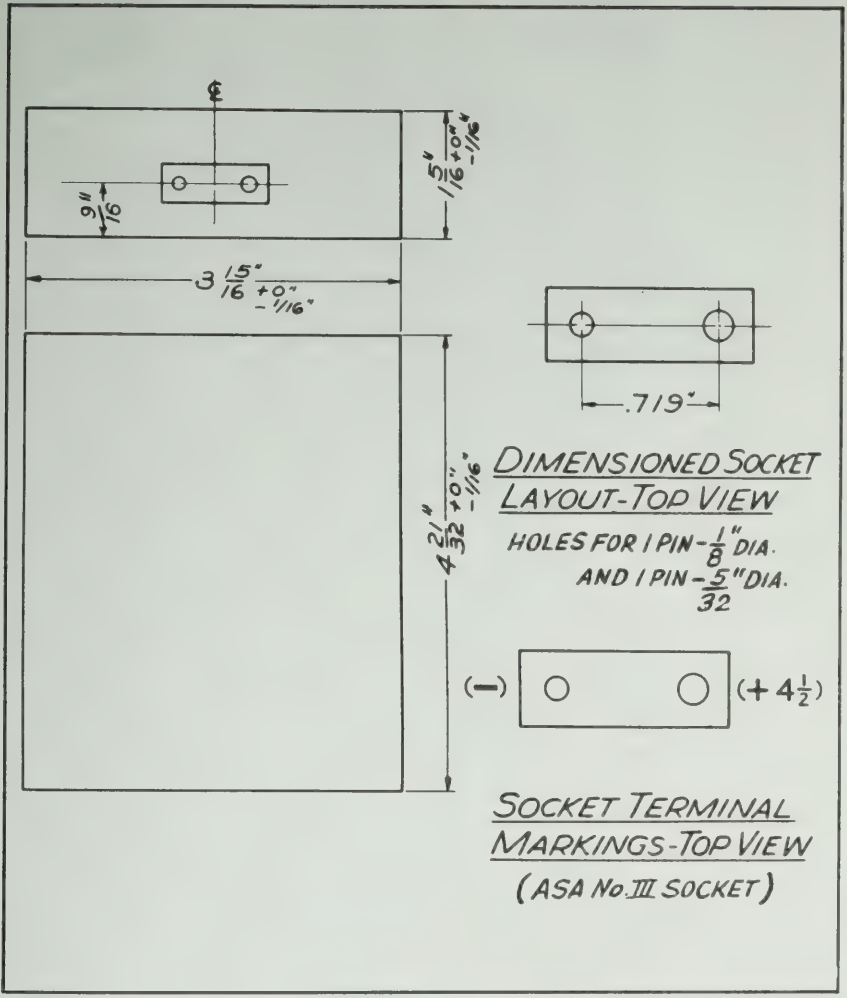
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 2.4V	2.7V	3.0V	3.3V	3.6V
2 hrs./day	5	1650	1550	1450	1400	1300
	10	900	840	780	720	640
	20	490	450	410	370	310
	30	340	310	280	250	200
	100	98	88	78	68	47
	200	41	37	33	27	16
	300	23	20.5	18	13.8	6.8
4 hrs./day	10	940	880	840	760	680
	20	475	425	400	335	300
	30	320	275	260	235	180
	100	90	75	56	44	36
	200	35	28	22	16	12
	300	19	15	12.3	8.5	4
24 hrs./day	5	2450	2350	2200	2000	1450
	10	1200	1050	940	880	620
	20	550	470	390	335	260
	30	350	275	250	220	155
	100	84	70	55	40	25
	200	33	26	20	13	8
	300	18	14	10.5	6.5	4

"EVEREADY" NO. 746 BATTERY

Type — Leclanché

NEDA Number — 7

Suggested Current Range: 0-300 milliamperes


℄
9"/16
1 5"/16 +0" -1/16"
3 15"/16 +0" -1/16"
4 21"/32 +0" -1/16"
.719"
DIMENSIONED SOCKET LAYOUT-TOP VIEW
HOLES FOR 1 PIN-1/8" DIA. AND 1 PIN-5/32" DIA.
(−)
(+ 4½)
SOCKET TERMINAL MARKINGS-TOP VIEW
(ASA No. III SOCKET)

SPECIFICATIONS

Voltage Taps	−, + 4.5
Terminals	Socket
Average Weight	1 lb. 3 oz.
Volume	24.0 cubic inches
Cells	Three No. 64 (ASA "G") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 746

Estimated Hours Service at 70°F

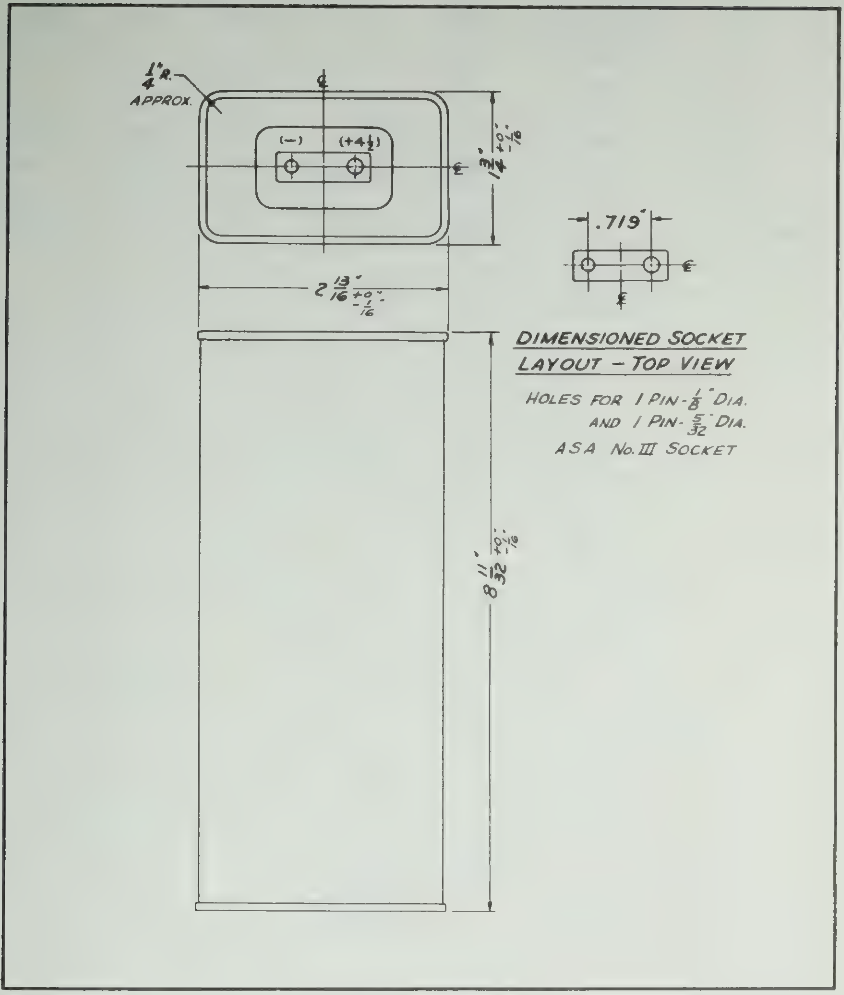
SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 3.0V
4 hrs./day	60	75	190 hours

"EVEREADY" NO. 2731 BATTERY

Type — Leclanché

NEDA Number—1303

Suggested Current Range: 0-200 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 4.5
Terminals	Socket
Average Weight	2 lbs. 11oz.
Volume	41.0 cubic inches
Cells	Six No. 250-5 Cathodic Envelope — Two parallel strings of three in series

For service information see reverse side of this sheet

"EVEREADY" NO. 2731

Estimated Hours Service at 70°F (Tentative)

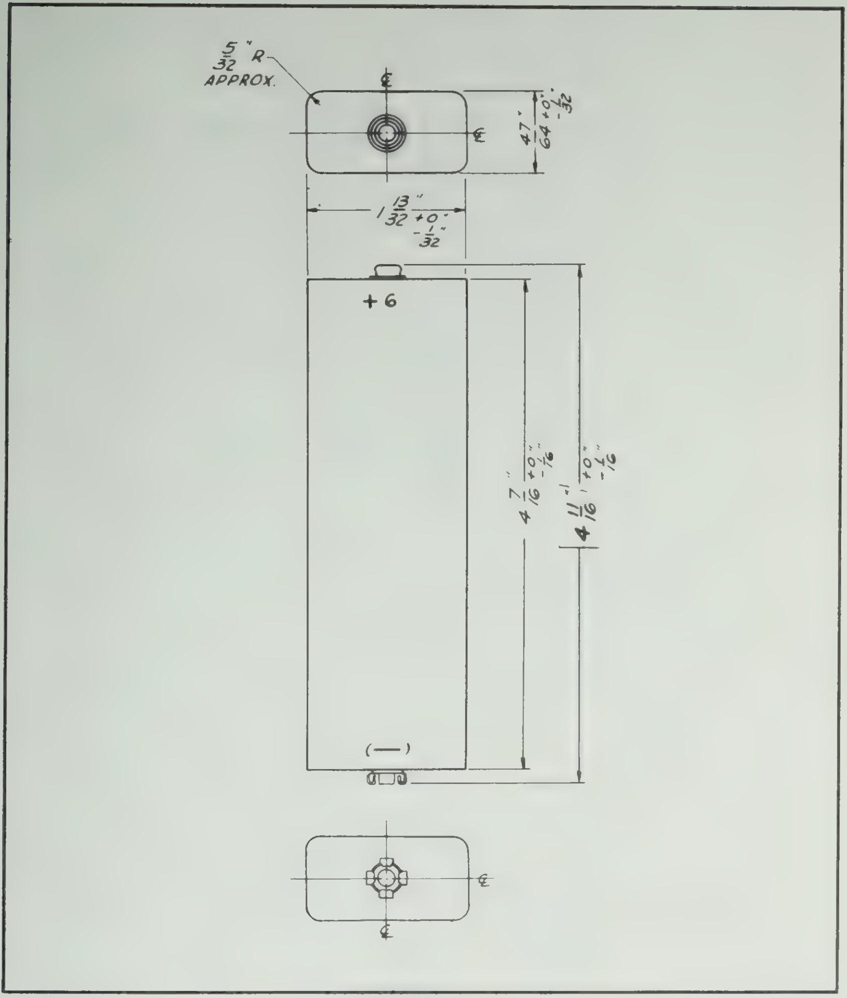
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 2.4V	2.7V	3.0V	3.3V	3.6V
2 hrs./day	30	1250				
	100	375				
4 hrs./day	30	1325	1250	1150	775	600
	50	700	625	500	375	350
24 hrs./day	30	1200	1140	1050	750	575

"EVEREADY" NO. 2713 BATTERY

Type — Leclanché

NEDA Number — 1403

Suggested Current Range: 0-25 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 6
Terminals	Miniature Snap
Average Weight	4 oz.
Volume	4.58 cubic inches
Cells	Four No. 213-1 Cathodic Envelope in series

For service information see reverse side of this sheet

"EVEREADY" NO. 2713

Estimated Hours Service at 70°F

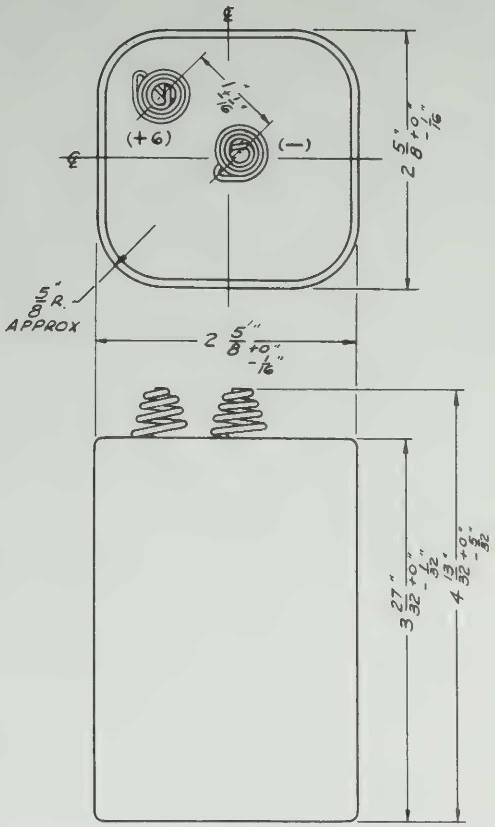
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 3.2V	3.6V	4.0V	4.4V	4.8V	5.2V
2 hrs./day	12	161	157	152	146	139	69
	16	123	122	119	112	107	52
	40	42.7	40.8	38	31.3	22.7	8.6
	75	21.4	19.0	16.4	13.4	8.5	2.9

"EVEREADY" NO. 509 BATTERY

Type — Leclanché

NEDA Number—908

Suggested Current Range: 0-250 milliamperes



BATTERY SHALL PASS FREELY THROUGH A CYLINDRICAL TUBE 3¼" DIAMETER x 4" LONG.

SPECIFICATIONS

Voltage Taps	—, + 6
Terminals	Two Coil Springs
Average Weight	1 lb. 5.5 oz.
Volume	26.5 cubic inches
Cells	Four No. 60 (ASA "F") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 509

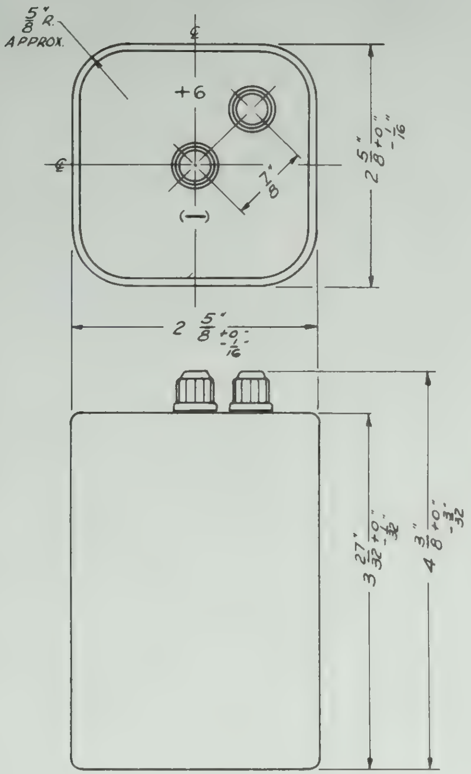
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE			
			2.3V	3.6V	4.0V	4.4V
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (Railroad-Lantern Battery Test)	187	32		37		
As Above	375	16		13		
As Above	667	9	9	5		
4 hrs./day	60	100		180	145	105

"EVEREADY" NO. 510S BATTERY

Type — Leclanché

Suggested Current Range: 0-250 milliamperes



TERMINAL POSTS - No. 8-32 THREAD

SPECIFICATIONS

Voltage Taps	—, + 6
Terminals	Plastic Knurls
Average Weight	1 lb. 7 oz.
Volume	26.5 cubic inches
Cells	Four No. 60 (ASA "F") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 510S

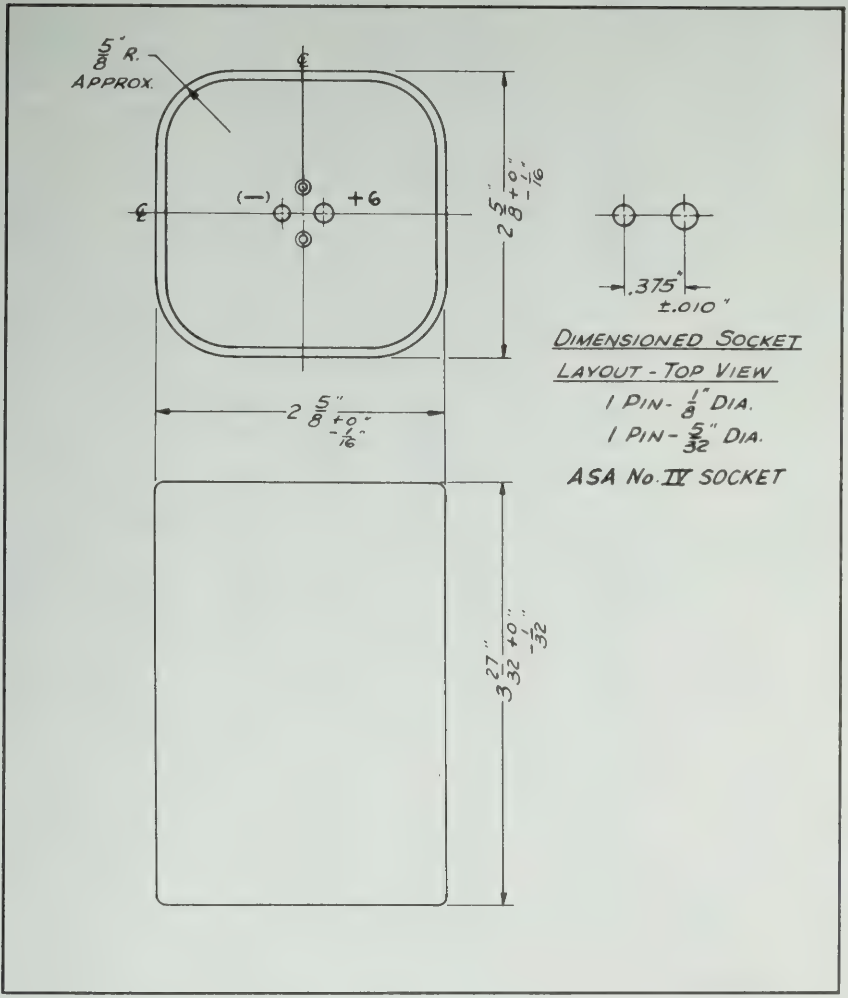
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE		
			3.6V	4.0V	4.4V
4 hrs./day	60	100	180	145	105

"EVEREADY" NO. 744 BATTERY

Type — Leclanché

Suggested Current Range: 0-250 milliamperes


$\frac{5}{8}$" R.
APPROX.
℄
℄
(—)
+6
$2\frac{5}{8}$" +0" $-\frac{1}{16}$"
$2\frac{5}{8}$" +0" $-\frac{1}{16}$"
.375"
±.010"
DIMENSIONED SOCKET
LAYOUT - TOP VIEW
1 PIN - $\frac{1}{8}$" DIA.
1 PIN - $\frac{5}{32}$" DIA.
ASA No. IV SOCKET
$3\frac{27}{32}$" +0" $-\frac{1}{32}$"

SPECIFICATIONS

Voltage Taps	—, + 6
Terminals	Socket
Average Weight	1 lb. 6 oz.
Volume	26.5 cubic inches
Cells	Four No. 60 (ASA "F") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 744

Estimated Hours Service at 70°F

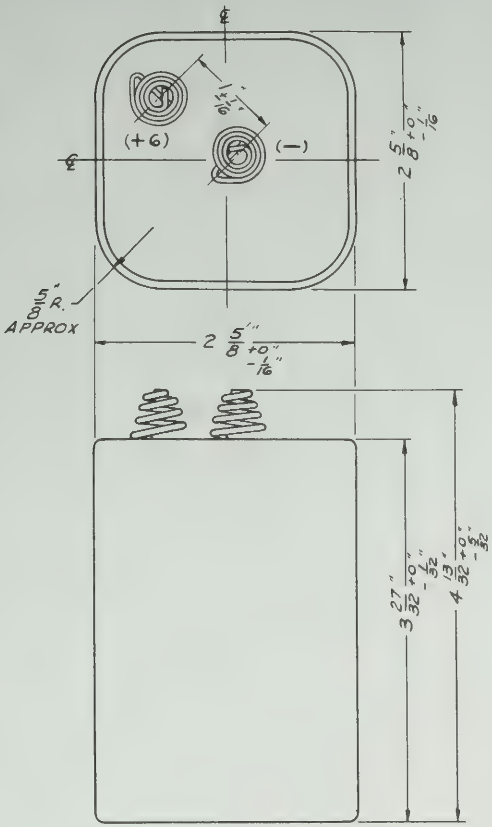
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		3.2V	3.6V	4.0V	4.4V	4.8V
2 hrs./day	5	1650	1550	1450	1400	1300
	10	900	840	780	720	640
	20	490	450	410	370	310
	30	340	310	280	250	200
	100	98	88	78	68	47
	200	41	37	33	27	16
	300	23	20.5	18	13.8	6.8
4 hrs./day	10	940	880	840	760	680
	20	475	425	400	335	300
	30	320	275	260	235	180
	100	90	75	56	44	36
	200	35	28	22	16	12
	300	19	15	12.3	8.5	4
24 hrs./day	5	2450	2350	2200	2000	1450
	10	1200	1050	940	880	620
	20	550	470	390	335	260
	30	350	275	250	220	155
	100	84	70	55	40	25
	200	33	26	20	13	8
	300	18	14	10.5	6.5	4

"EVEREADY" NO. 409 BATTERY

Type — Leclanché

NEDA Number—916

Suggested Current Range: 0-250 milliamperes



BATTERY SHALL PASS FREELY THROUGH A CYLINDRICAL TUBE 3¼" DIAMETER x 4" LONG.

SPECIFICATIONS

Voltage Taps	−, + 6
Terminals	Two Coil Springs
Average Weight	1 lb. 6.5 oz.
Volume	26.5 cubic inches
Cells	Four No. 60 (ASA "F") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 409

Estimated Hours Service at 70°F

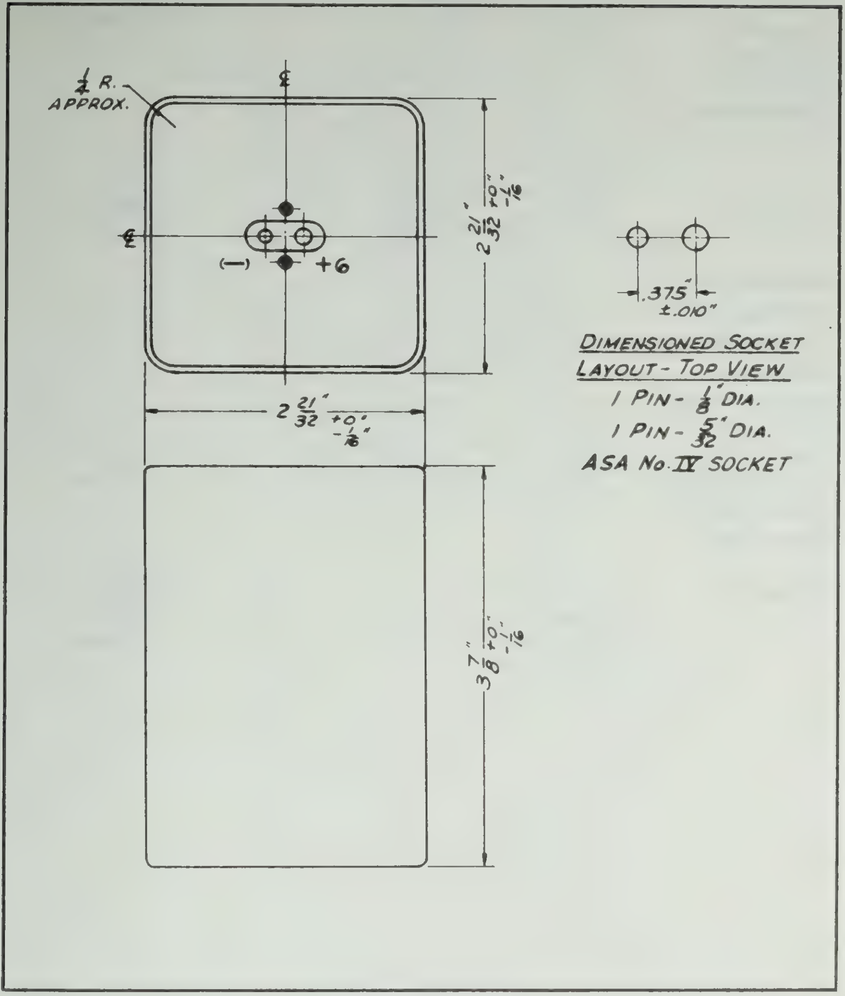
SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE		
			2.3V	3.0V	3.6V
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (Railroad-Lantern Battery Test)	187	32			55
As Above	375	16		24	19
As Above	667	9	13		6

"EVEREADY" NO. 2744 BATTERY

Type — Leclanché

NEDA Number — 920

Suggested Current Range: 0-500 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 6
Terminals	Socket
Average Weight	1 lb. 14 oz.
Volume	27.3 cubic inches
Cells	Four No. 260-6 Cathodic Envelope in series

For service information see reverse side of this sheet

"EVEREADY" NO. 2744

Estimated Service at 70°F

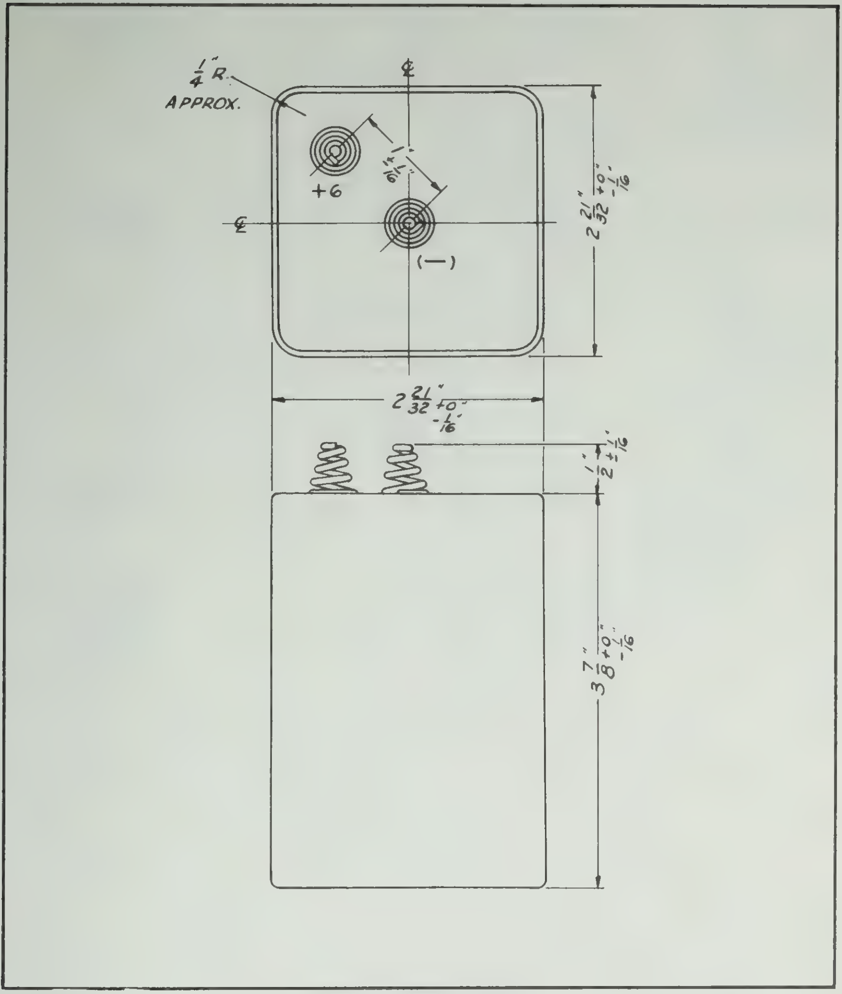
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 3.6V
24 hrs./day (Simulated Flasher Test — Transistorized Type)	8.5	700	2500 hrs.
As Above	17	350	1180 hrs.
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (Railroad-Lantern Battery Test)	375	16	30 hrs.
24 hrs./day	20		1000 hrs.
	100		130 hrs.
	670		7 hrs.

"EVEREADY" NO. 2745 BATTERY

Type — Leclanché

NEDA Number — 924

Suggested Current Range: 0-500 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 6
Terminals	Coil Springs
Average Weight	1 lb. 14 oz.
Volume	27.3 cubic inches
Cells	Four No. 260-6 Cathodic Envelope in series

For service information see reverse side of this sheet

"EVEREADY" NO. 2745

Estimated Service at 70°F

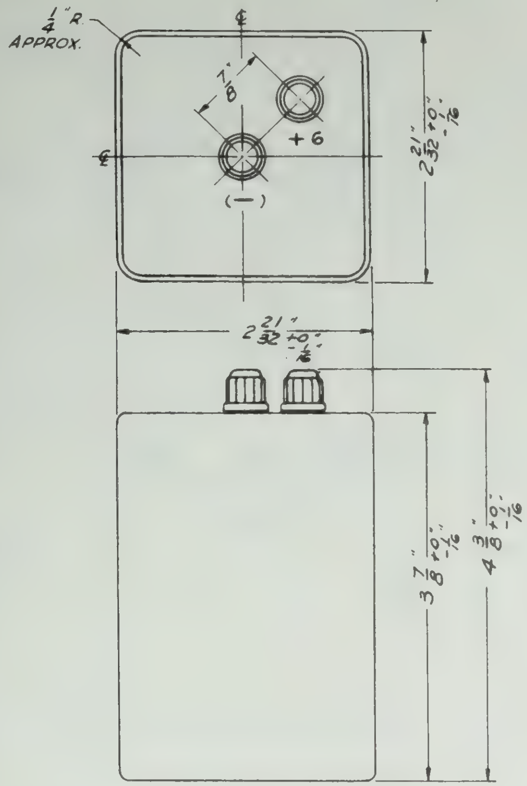
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 3.6V
24 hrs./day (Simulated Flasher Test — Transistorized Type)	8.5	700	2500 hrs.
As Above	17	350	1180 hrs.
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (Railroad-Lantern Battery Test)	375	16	30 hrs.
24 hrs./day	20		1000 hrs.
	100		130 hrs.
	670		7 hrs.

"EVEREADY" NO. 2746 BATTERY

Type — Leclanché

NEDA Number — 925

Suggested Current Range: 0-500 milliamperes



TERMINAL POSTS - No. 8-32 THREAD.

SPECIFICATIONS

Voltage Taps	−, + 6
Terminals	Plastic Knurls
Average Weight	1 lb. 14 oz.
Volume	27.3 cubic inches
Cells	Four No. 260-6 Cathodic Envelope in series

For service information see reverse side of this sheet

"EVEREADY" NO. 2746

Estimated Service at 70°F

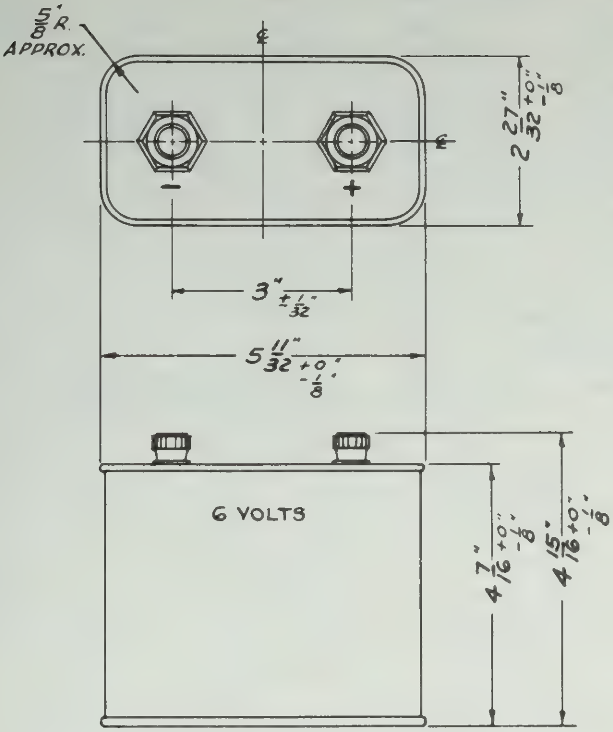
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE
			3.6V
24 hrs./day (Simulated Flasher Test – Transistorized Type)	8.5	700	2500 hrs.
As Above	17	350	1180 hrs.
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (Railroad-Lantern Battery Test)	375	16	30 hrs.
24 hrs./day	20		1000 hrs.
	100		130 hrs.
	670		7 hrs.

"EVEREADY" NO. 731 BATTERY

Type — Leclanché

NEDA Number—918

Suggested Current Range: 0-500 milliamperes



TERMINAL POSTS - No. 8-32 THREAD

SPECIFICATIONS

Voltage Taps	−, + 6
Terminals	Insulated Screw
Average Weight	3 lbs. 4 oz.
Volume	69.5 cubic inches
Cells	Eight No. 60 (ASA "F")—Two parallel strings of four in series

For service information see reverse side of this sheet

"EVEREADY" NO. 731

Estimated Hours Service at 70°F

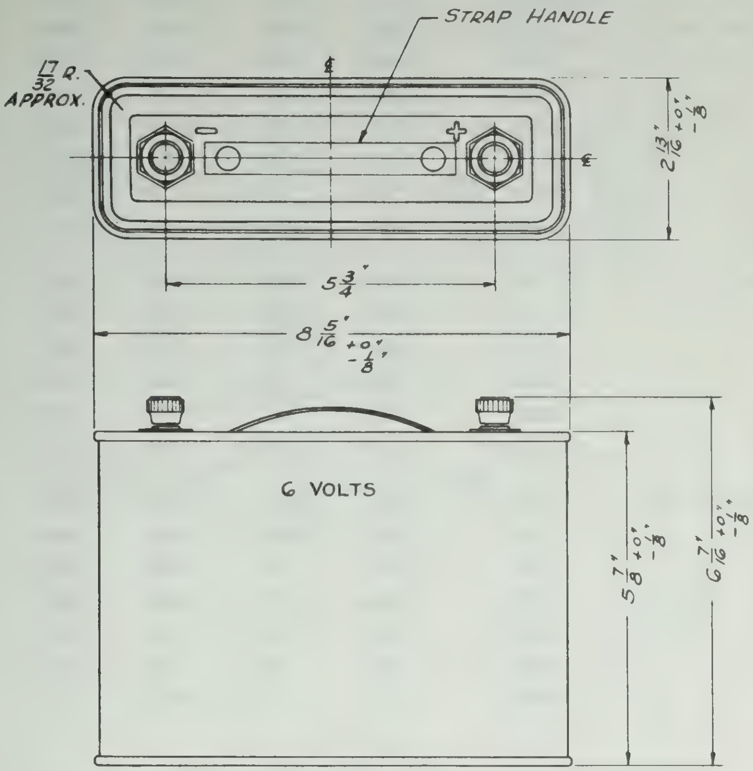
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE		
			3.2V	3.6V	4.0V
6 hrs./day	667	9	17	15	11
24 hrs./day	667	9	15	12	10
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (Railroad-Lantern Battery Test)	667	9	22	19	15

"EVEREADY" NO. 706 BATTERY

Type — Leclanché

NEDA Number—902

Suggested Current Range: 0-1000 milliamperes



TERMINAL POSTS - No. 8-32 THREAD

SPECIFICATIONS

Voltage Taps..−, + 6
Terminals ....Insulated Screw
Average Weight..5 lbs. 14 oz.
Volume..137 cubic inches
Cells......................Sixteen No. 60 (ASA "F") — Four parallel strings of four in series

For service information see reverse side of this sheet

"EVEREADY" NO. 706

Estimated Hours Service at 70°F

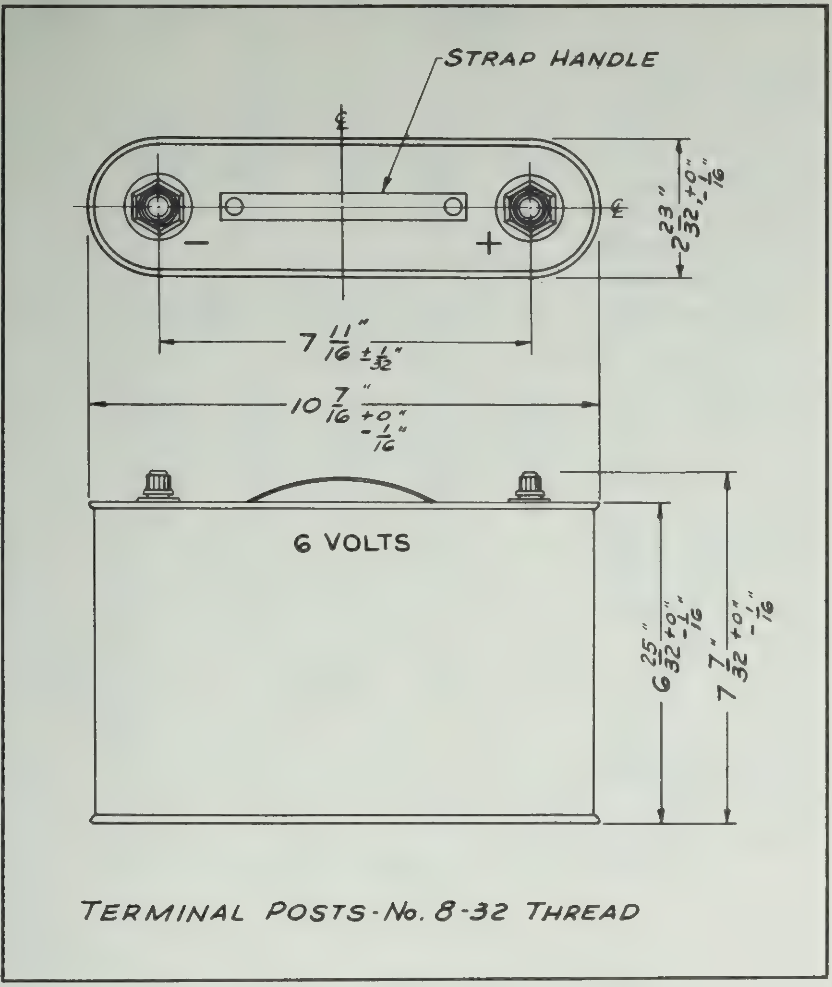
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		3.2V	3.6V	4.0V	4.4V	4.8V
2 hrs./day	20	1650	1550	1450	1400	1300
	40	900	840	780	720	640
	80	490	450	410	370	310
	120	340	310	280	250	200
	400	98	88	78	68	47
	800	41	37	33	27	16
	1200	23	20.5	18	13.8	6.8
4 hrs./day	40	940	880	840	760	680
	80	475	425	400	335	300
	120	320	275	260	235	180
	400	90	75	56	44	36
	800	35	28	22	16	12
	1200	19	15	12.3	8.5	4
24 hrs./day	20	2450	2350	2200	2000	1450
	40	1200	1050	940	880	620
	80	550	470	390	335	260
	120	350	275	250	220	155
	400	84	70	55	40	25
	800	33	26	20	13	8
	1200	18	14	10.5	6.5	4

"EVEREADY" NO. 1461 BATTERY

Type — Leclanché

NEDA Number—907

Suggested Current Range: 0-1500 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 6
Terminals	Plastic Knurls
Average Weight	9 lbs. 4 oz.
Volume	199 cubic inches
Cells	Four No. 6 (ASA "6") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 1461

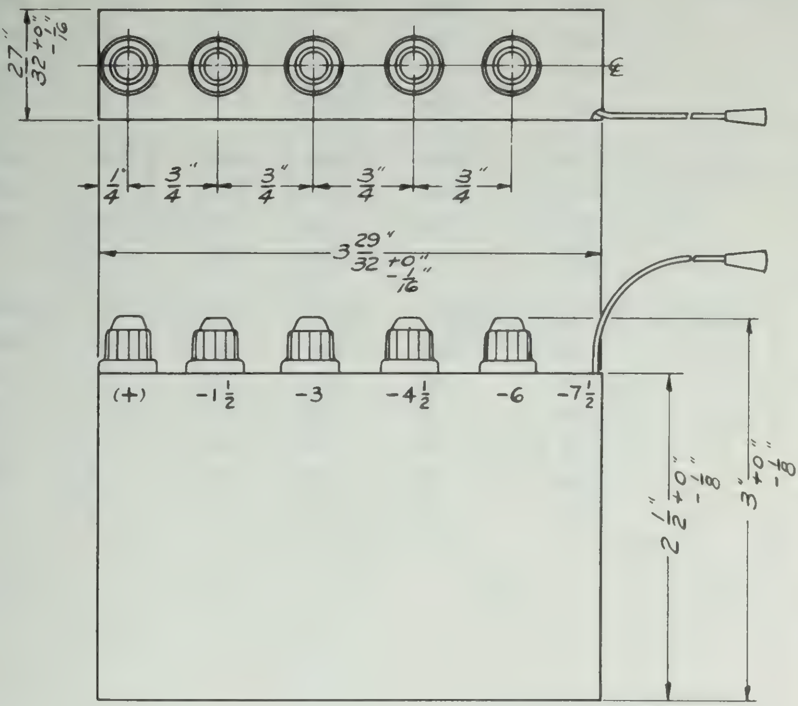
Estimated Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 3.4V	CUT-OFF VOLTAGE 3.7V
Discharge for 2 periods of 1 hour each daily according to the following schedule: 1 hour discharge, 6 hour rest, 1 hour discharge, 16 hour rest. (Heavy Intermittent Test)	562	10.67	80 hrs.	
Discharge for 10 periods of 4 min. each beginning at hourly intervals, during 6 days per week. On the remaining day, every other discharge period shall be omitted. (There are 65 such discharge periods per week or a total weekly service of 260 minutes) (Light Intermittent test)	225	26.67		250 days

"EVEREADY" NO. 773 BATTERY

Type — Leclanché

Suggested Current Range: 0-50 milliamperes



TERMINAL POSTS - No. 8-32 THREAD

SPECIFICATIONS

Voltage Taps	+, −1.5, −3, −4.5, −6, −7.5
Terminals	5 Plastic Knurls, 1 Wire
Average Weight	9 oz.
Volume	8.24 cubic inches
Cells	Five No. 30 (ASA "B") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 773

Estimated Hours Service at 70°F

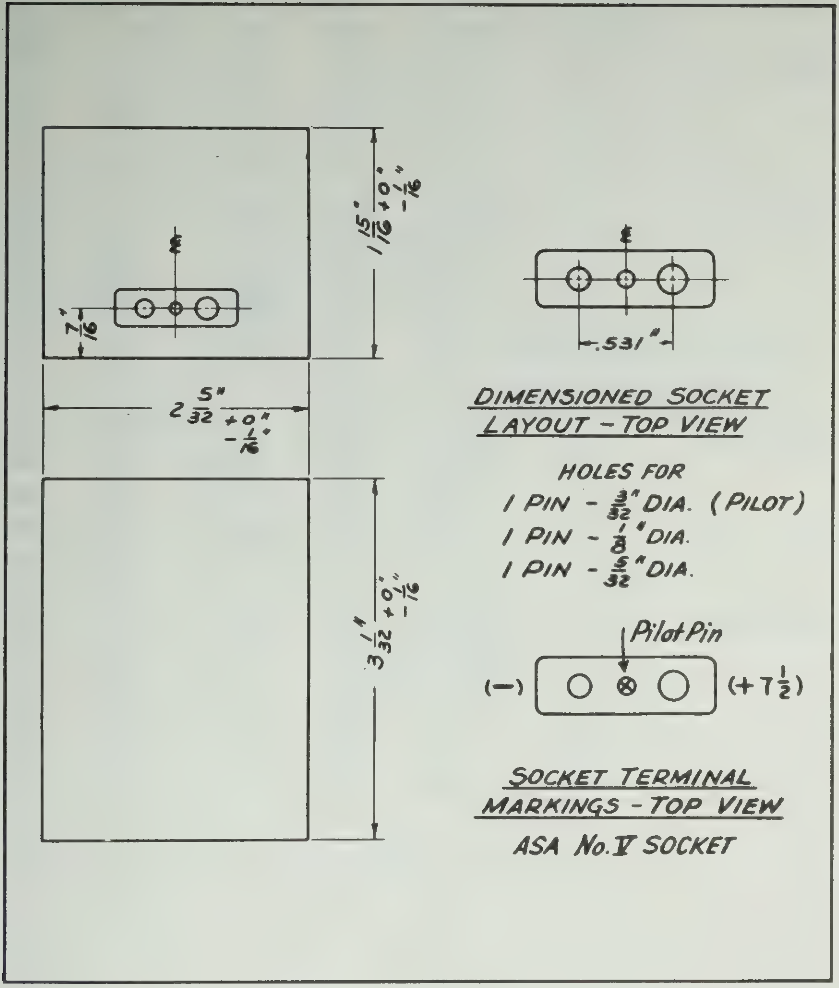
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 4.0V	4.5V	5.0V	5.5V	6.0V
2 hrs./day	5	420	380	340	290	250
	10	220	190	155	130	107
	20	110	90	75	57	45
	50	37	30	24	18	13.5
	100	14.5	11.5	9	6.2	4.5
4 hrs./day	5	480	450	410	330	265
	10	240	215	190	150	100
	20	110	90	75	55	40
	50	28	22	18.5	14	7
24 hrs./day	1	3040	2990	2920	2600	1850
	5	610	530	440	390	300
	10	205	170	130	110	80
	20	87	70	50	37	27
	50	26	20	13	9	6
	100	10	7.5	4.5	3	2.2
	300	1.9	1.3	.7	.3	.1

"EVEREADY" NO. 717 BATTERY

Type — Leclanché

NEDA Number—9

Suggested Current Range: 0-70 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 7.5
Terminals	Socket
Average Weight	8 oz.
Volume	13.0 cubic inches
Cells	Five No. 172 in series

For service information see reverse side of this sheet

"EVEREADY" NO. 717

Estimated Hours Service at 70°F

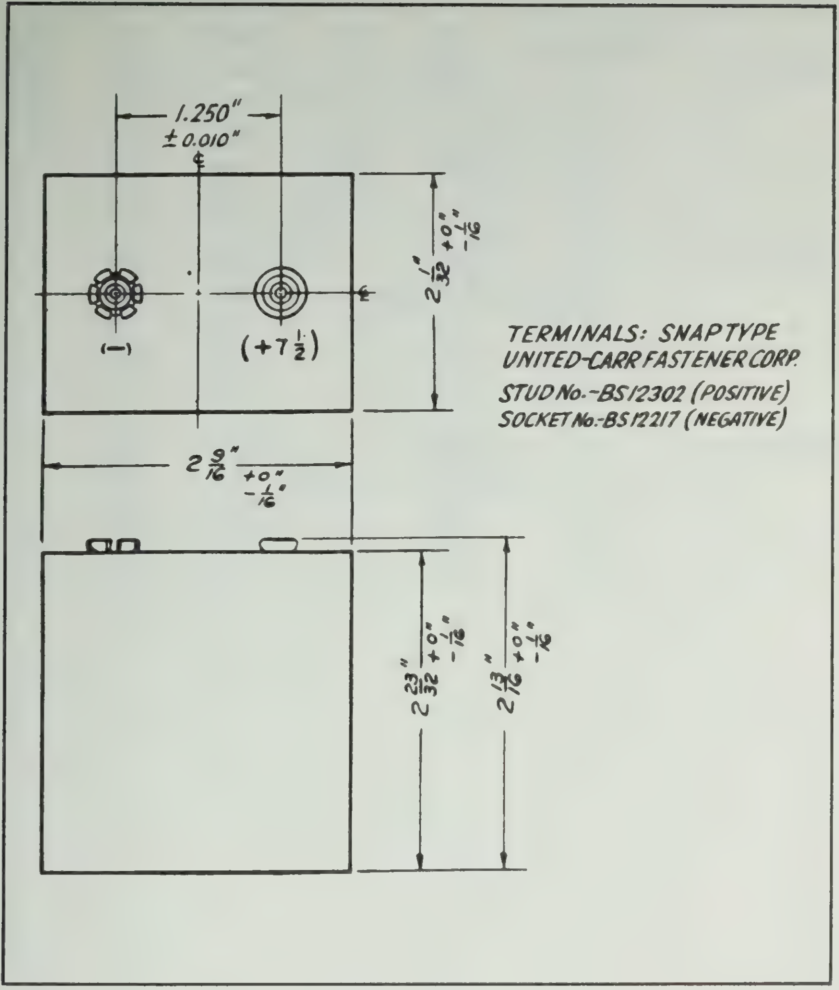
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 4.0V	4.5V	5.0V	5.5V	6.0V
2 hrs./day	10	485	430	350	295	240
	20	270	230	185	155	120
	40	125	108	85	68	45
	80	50	40	32	22	10
4 hrs./day	3	1925	1800	1650	1325	1050
	5	1350	1220	1080	840	590
	10	580	520	450	340	255
	20	270	240	200	150	105
	40	120	100	80	60	26
	80	40	35	25	20	8
8 hrs./day	3	1700	1600	1470	1260	940
	5	1080	1000	900	750	540
	10	520	470	410	340	230
	20	220	195	170	135	85
	40	88	75	65	50	27
24 hrs./day	3	2075	1950	1800	1600	1150
	5	1175	1050	980	840	580
	10	490	430	380	300	210
	20	195	165	140	104	72
	40	75	60	48	33	24
	80	25	20	15	10	6

"EVEREADY" NO. 707 BATTERY

Type — Leclanché

NEDA Number—26

Suggested Current Range: 0-30 milliamperes


1.250"
± 0.010"
℄
℄
(−)
(+7½)
$2\frac{1}{32}''$ $^{+0''}_{-\frac{1}{16}}$
TERMINALS: SNAP TYPE
UNITED-CARR FASTENER CORP.
STUD No.-BS12302 (POSITIVE)
SOCKET No.-BS12217 (NEGATIVE)
$2\frac{9}{16}''$ $^{+0''}_{-\frac{1}{16}''}$
$2\frac{23}{32}''$ $^{+0''}_{-\frac{1}{16}''}$
$2\frac{13}{16}''$ $^{+0''}_{-\frac{1}{16}''}$

SPECIFICATIONS

Voltage Taps	—, + 7.5
Terminals	Snap
Average Weight	12 oz.
Volume	14.1 cubic inches
Cells	Five No. 175 (ASA F100) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 707

Estimated Hours Service at 70°F

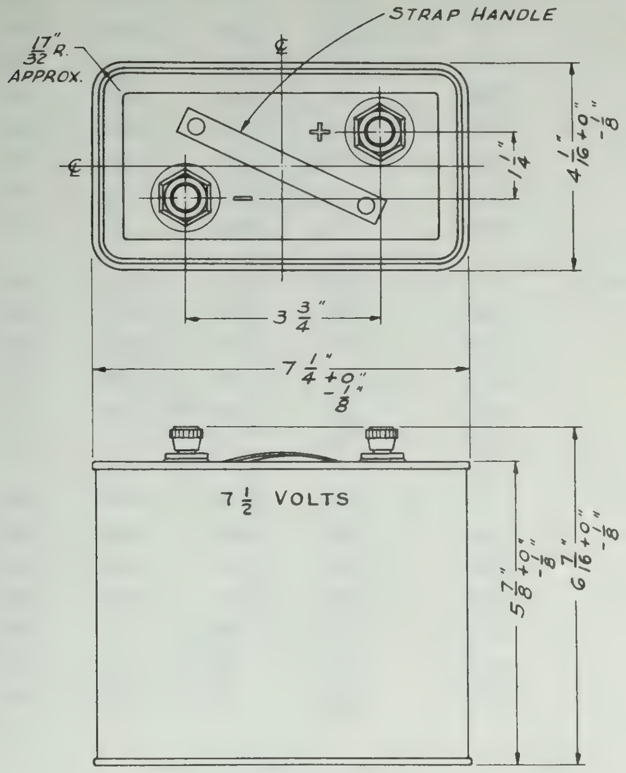
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		4.0V	4.5V	5.0V	5.5V	6.0V
2 hrs./day	5	920	860	800	715	600
	10	540	480	440	380	300
	20	300	275	245	200	140
	30	200	170	150	130	85
	50	110	95	80	60	38
4 hrs./day	5	1600		1250	900	
	10	750		580	410	
	20	350		230	170	
	30	200		135	100	
	50	110		72	56	
24 hrs./day	5	1600		1350	1000	
	10	700		540	380	
	20	280		210	140	
	30	170		125	80	
	50	90		65	40	

"EVEREADY" NO. 715 BATTERY

Type — Leclanché

NEDA Number—903

Suggested Current Range: 0-1000 milliamperes



TERMINAL POSTS - No. 8-32 THREAD

SPECIFICATIONS

Voltage Taps	—, + 7.5
Terminals	Insulated Screw
Average Weight	7 lbs. 10 oz.
Volume	173 cubic inches
Cells	Twenty No. 60 (ASA "F")—Four parallel strings of five in series

For service information see reverse side of this sheet

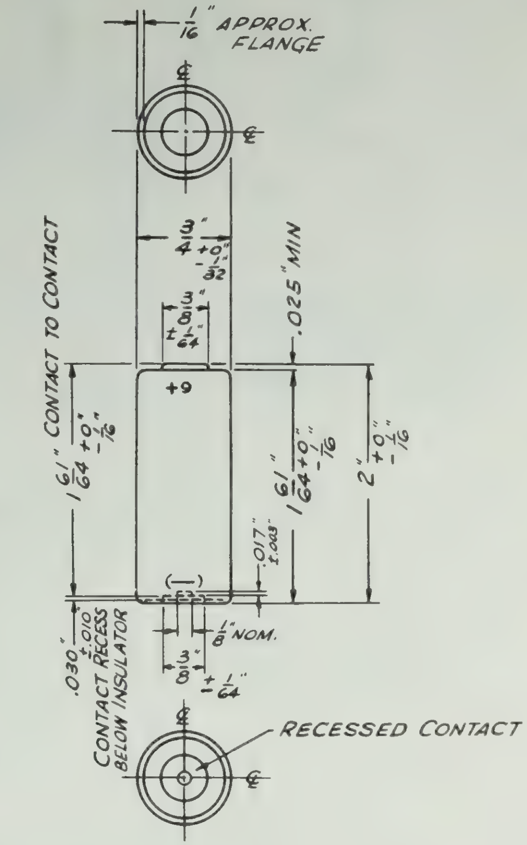
"EVEREADY" NO. 715

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 4.0V	4.5V	5.0V	5.5V	6.0V
2 hrs./day	20	1650	1550	1450	1400	1300
	40	900	840	780	720	640
	80	490	450	410	370	310
	120	340	310	280	250	200
	400	98	88	78	68	47
	800	41	37	33	27	16
	1200	23	20.5	18	13.8	6.8
4 hrs. /day	40	940	880	840	760	680
	80	475	425	400	335	300
	120	320	275	260	235	180
	400	90	75	56	44	36
	800	35	28	22	16	12
	1200	19	15	12.3	8.5	4
24 hrs./day	20	2450	2350	2200	2000	1450
	40	1200	1050	940	880	620
	80	550	470	390	335	260
	120	350	275	250	220	155
	400	84	70	55	40	25
	800	33	26	20	13	8
	1200	18	14	10.5	6.5	4

"EVEREADY" NO. 206 BATTERY

Type — Leclanché
NEDA Number — 1611
Suggested Current Range: 0-7 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 9
Terminals	Flat Contacts, Negative Recessed
Average Weight	1.2 oz.
Volume	0.85 cubic inches
Cells	Six No. 109 in series

For service information see reverse side of this sheet

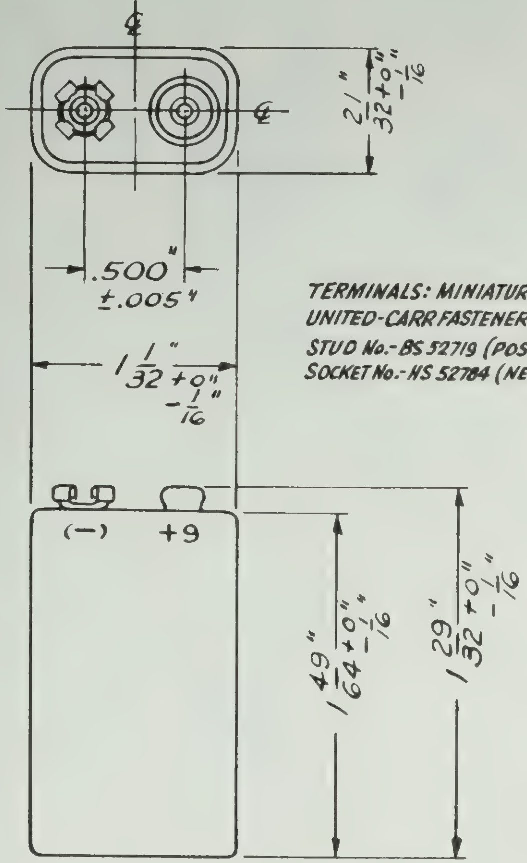
"EVEREADY" NO. 206

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 3.6V	4.8V	6.0V
2 hrs./day	5	1800	95	93	80
	12	750	30	26	20
	16	560	26	22	15
	25.7	350	15	10	5
4 hrs./day	12	750	34	26	

"EVEREADY" NO. 216 BATTERY

Type — Leclanché
NEDA Number—1604
Suggested Current Range: 0-8 milliamperes


℄
℄
21/32" +0" −1/16"
.500" ±.005"
1 1/32" +0" −1/16"
TERMINALS: MINIATURE SNAP
UNITED-CARR FASTENER CORP.
STUD No.- BS 52719 (POSITIVE)
SOCKET No.- HS 52784 (NEGATIVE)
(−)
+9
1 49/64" +0" −1/16"
1 29/32" +0" −1/16"

SPECIFICATIONS

Voltage Taps	−, + 9
Terminals	Miniature Snap
Average Weight	1.3 oz.
Volume	1.20 cubic inches
Cells	Six No. 116 in series

For service information see reverse side of this sheet

"EVEREADY" NO. 216

Estimated Hours Service at 70°F (Tentative)

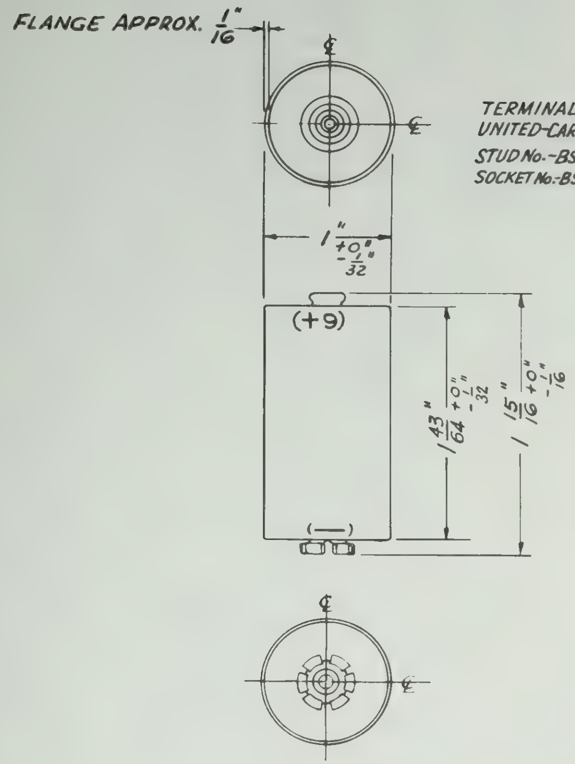
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 3.6V	4.8V	5.4V	6.0V	6.6V	7.2V
2 hrs./day	4	100	87	83	78	68	49
	6	72	63	60	53	46	32
	10	48	40	38	32	27	17
	15	32	27	25	20	15	9
	25	20	15	12	9	6	2

"EVEREADY" NO. 226 BATTERY

Type — Leclanché

NEDA Number—1600

Suggested Current Range: 0-9 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 9
Terminals	Snap
Average Weight	2.0 oz.
Volume	1.31 cubic inches
Cells	Six No. 127 in series

For service information see reverse side of this sheet

"EVEREADY" NO. 226

Estimated Hours Service at 70°F

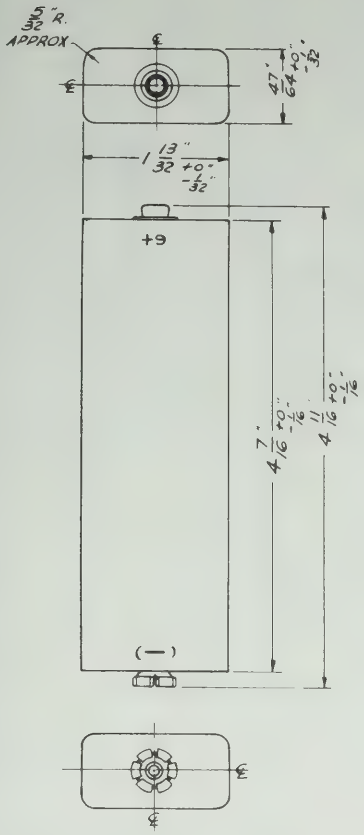
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 4.8V	CUT-OFF VOLTAGE 6.0V
2 hrs. /day	5	1800	150	130
2 hrs./day	7	1300	117	98
2 hrs./day	11.5	780	68	57
2 hrs./day	16	560	44	33

"EVEREADY" NO. 2709 BATTERY

Type — Leclanché

NEDA Number — 1613

Suggested Current Range: 0-20 milliamperes



TERMINALS: SNAP TYPE
UNITED-CARR FASTENER CORP.
STUD No.-BS12302 (POSITIVE)
SOCKET No.-BS12217 (NEGATIVE)

SPECIFICATIONS

Voltage Taps	—, + 9
Terminals	Snap
Average Weight	4 oz.
Volume	4.57 cubic inches
Cells	Six No. 208-1 Cathodic Envelope in series

For service information see reverse side of this sheet

"EVEREADY" NO. 2709

Estimated Hours Service at 70°F (Tentative)

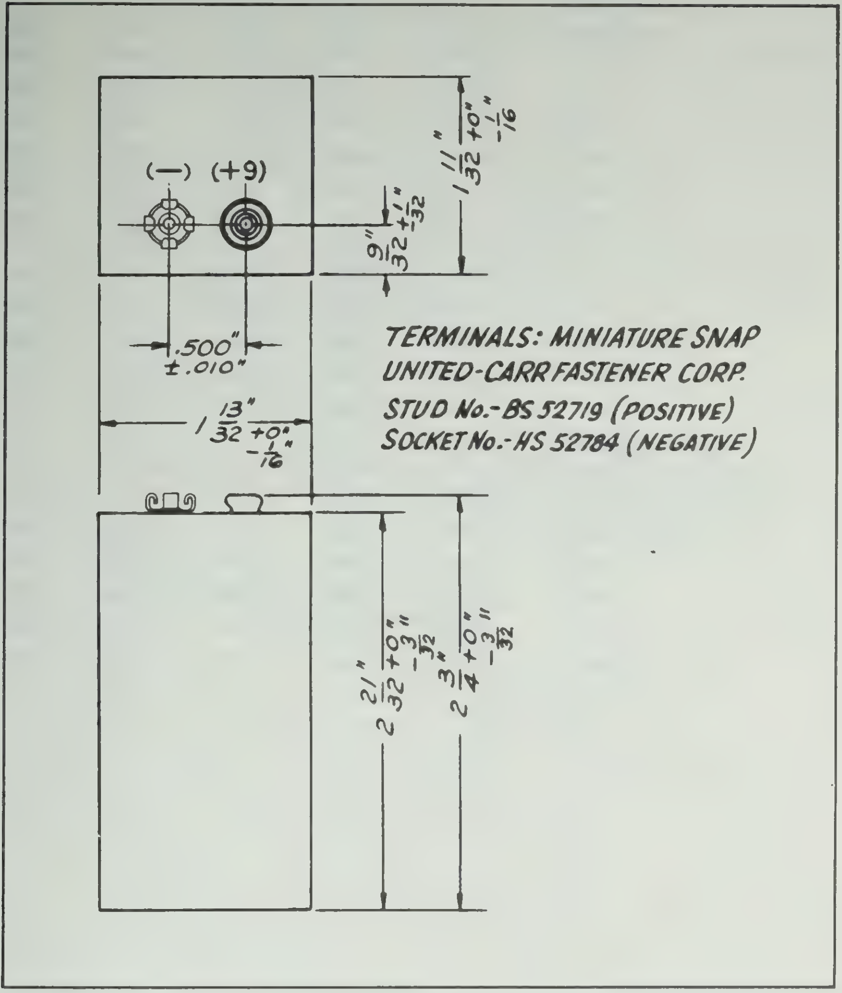
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 4.8V	5.4V	6.0V	6.6V	7.2V	7.8V
2 hrs./day	5	213	207	197	187	161	96
	12	90	89	86	83	76	34
	40	24.4	22.6	19.6	16.4	10.7	2.4
	60	14.4	12.1	10.3	8.5	4.7	1.0

"EVEREADY" NO. 246 BATTERY

Type — Leclanché

NEDA Number—1602

Suggested Current Range: 0-15 milliamperes


(—) (+9)
$1\frac{11}{32}$" +0" −$\frac{1}{16}$"
$\frac{9}{32}$" ±$\frac{1}{32}$"
.500" ±.010"
$1\frac{13}{32}$" +0" −$\frac{1}{16}$"
$2\frac{21}{32}$" +0" −$\frac{3}{32}$"
$2\frac{3}{4}$" +0" −$\frac{3}{32}$"

TERMINALS: MINIATURE SNAP
UNITED-CARR FASTENER CORP.
STUD No.-BS 52719 (POSITIVE)
SOCKET No.-HS 52784 (NEGATIVE)

SPECIFICATIONS

Voltage Taps	—, + 9
Terminals	Miniature Snap
Average Weight	4.5 oz.
Volume	5.02 cubic inches
Cells	Six No. 148 in series

For service information see reverse side of this sheet

"EVEREADY". NO. 246

Estimated Hours Service at 70°F

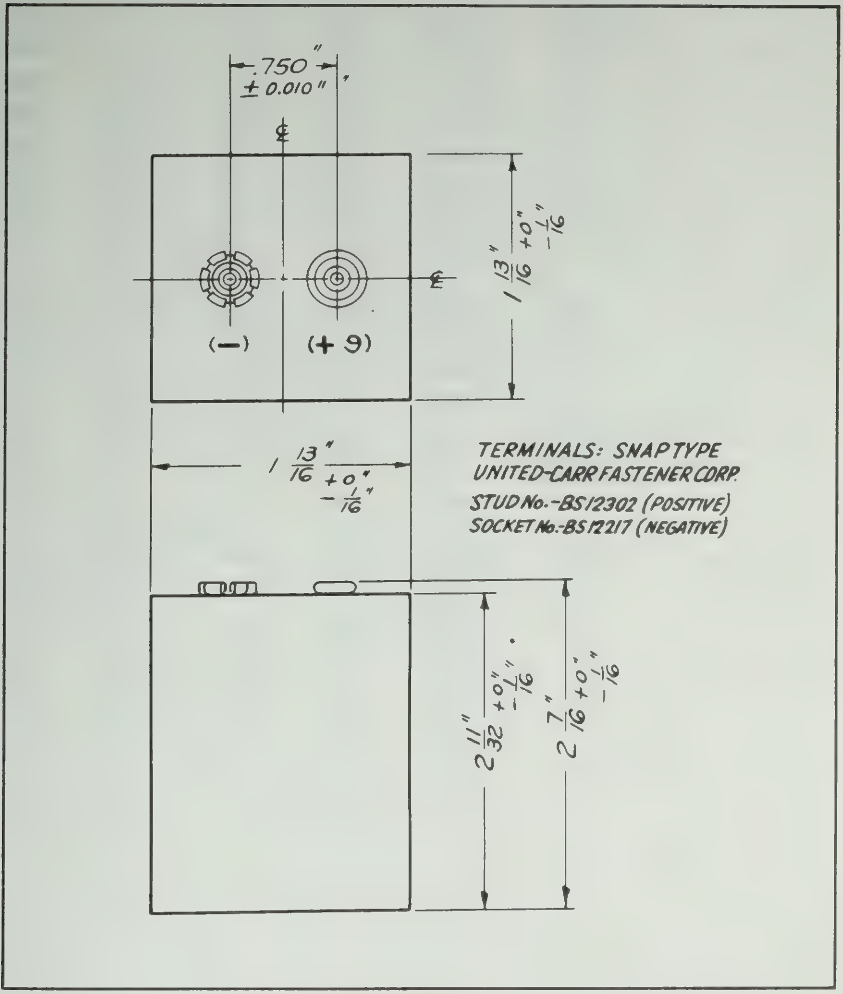
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		4.8V	5.4V	6.0V	6.6V	7.2V
2 hrs./day	2	820	780	725	640	550
	6	380	350	320	275	205
	10	240	220	195	165	115
	20	115	100	85	65	42
	40	45	38	30	22	12
	80	15	12	9	6	1.8
4 hrs./day	2	1005	980	925	805	640
	6	410	380	350	310	210
	10	255	220	195	165	110
	20	100	85	72	58	35
	40	34	28	23	17	9
	80	9.5	7.5	6	3.4	1.8
24 hrs./day	2	1420	1260	1100	910	665
	6	350	305	255	215	160
	10	165	145	120	100	75
	20	62	52	42	34	25
	40	22.5	18.5	15	11	6.8
	80	7.8	6.4	5	3.4	1.8

"EVEREADY" NO. 266 BATTERY

Type — Leclanché

NEDA Number—1605

Suggested Current Range: 0-20 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 9
Terminals	Snap
Average Weight	7 oz.
Volume	7.70 cubic inches
Cells	Six No. 165 (ASA F90) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 266

Estimated Hours Service at 70°F

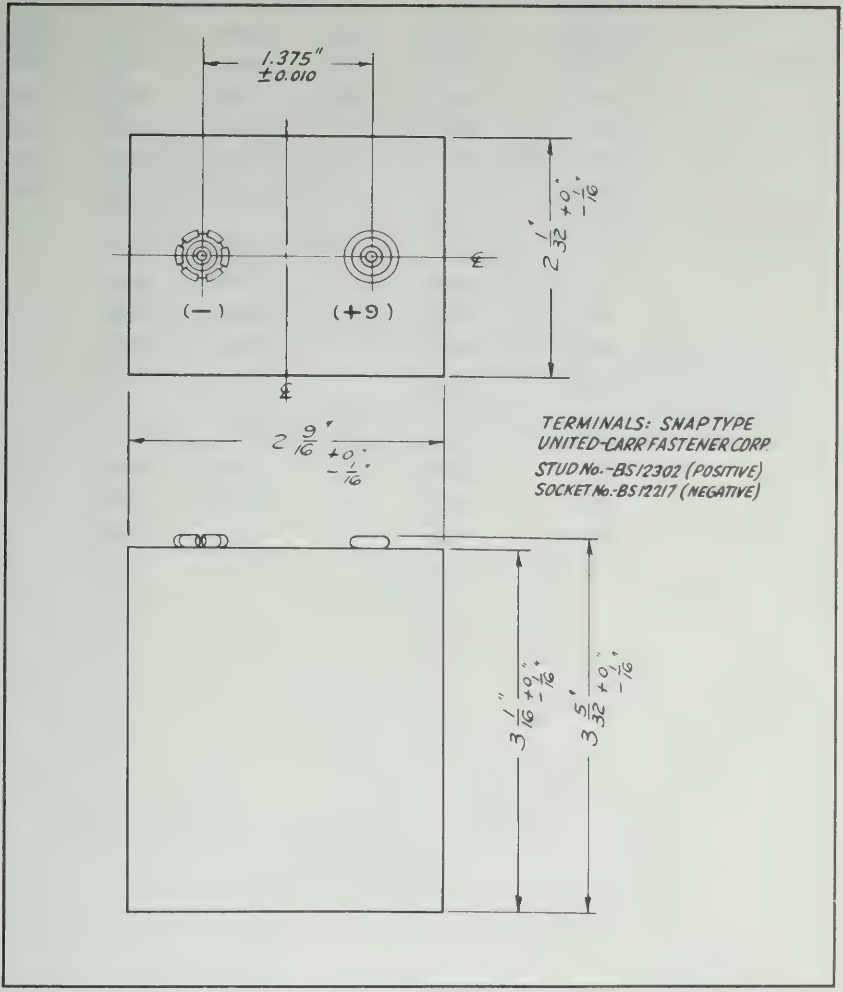
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 4.8V	5.4V	6.0V	6.6V	7.2V
4 hrs. /day	0.5	2400	2200	1950	1700	1400
	1.0	1650	1500	1300	1140	920
	5.0	520	470	395	320	240
	10	295	265	220	170	125
	20	138	120	96	70	45
	40	50	43	32	21.5	9.5
	80	14.5	11.5	8	3.3	1.3
8 hrs./day	0.5	3400	3200	2850	2600	2150
	1.0	2150	1975	1800	1650	1320
	5.0	570	530	475	350	250
	10	285	255	220	150	98
	20	118	102	84	52	30
	40	42	34	27	15	5.7
	80	12.5	10	7	3.3	1.3
24 hrs./day	0.5	6000	5600	5200	4800	4200
	1.0	3350	3100	2900	2575	2100
	5.0	640	590	500	375	230
	10	275	250	205	138	78
	20	105	92	74	44	23
	40	37	30	23	12.3	5.7
	80	11.5	9	7	3.3	1.3

"EVEREADY" NO. 276 BATTERY

Type — Leclanché

NEDA Number—1603

Suggested Current Range: 0-30 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 9
Terminals	Snap
Average Weight	15 oz.
Volume	16.3 cubic inches
Cells	Six No. 175 (ASA F100) in series

For service information see reverse side of this sheet

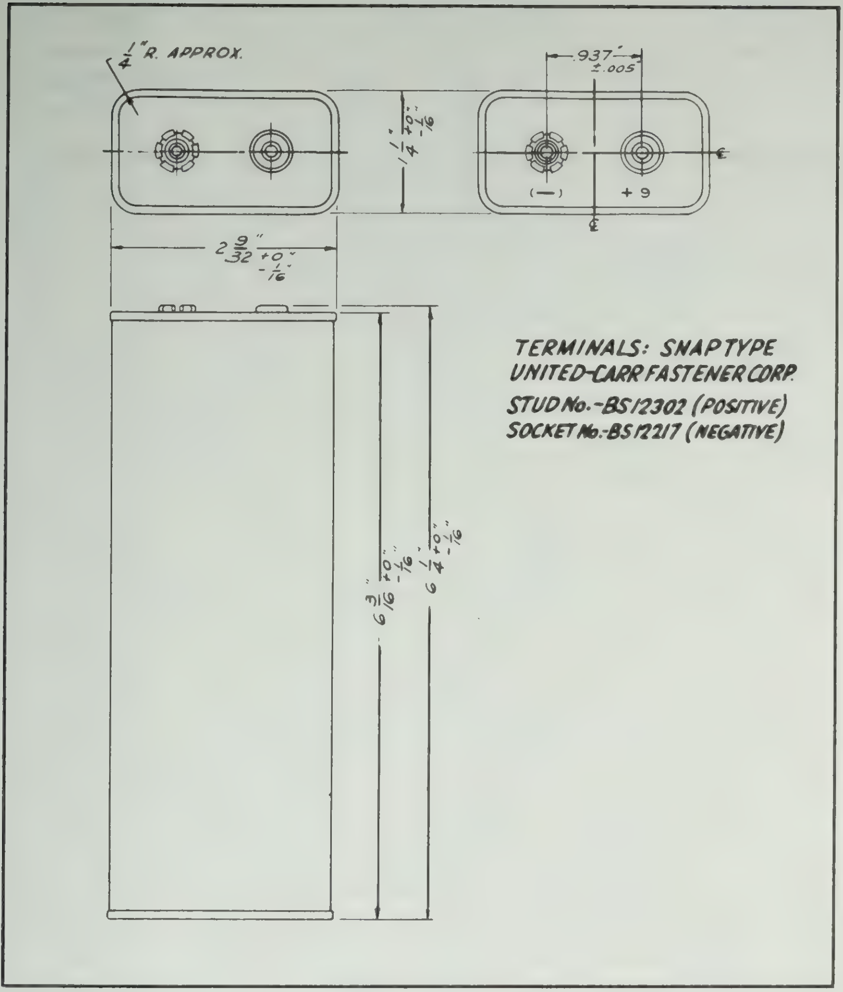
"EVEREADY" NO. 276

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 4.8V	5.4V	6.0V	6.6V	7.2V
2 hrs./day	5	920	860	800	715	600
	10	540	480	440	380	300
	20	300	275	245	200	140
	30	200	170	150	130	85
	50	110	95	80	60	38
4 hrs. /day	5	1600		1250	900	
	10	750		580	410	
	20	350		230	170	
	30	200		135	100	
	50	110		72	56	
24 hrs./day	5	1600		1350	1000	
	10	700		540	380	
	20	280		210	140	
	30	170		125	80	
	50	90		65	40	

"EVEREADY" NO. 2356 BATTERY

Type — Leclanché
NEDA Number — 1612
Suggested Current Range: 0-30 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 9
Terminals	Snap
Average Weight	1 lb.
Volume	17.6 cubic inches
Cells	Six No. 240-2 Cathodic Envelope in series

For service information see reverse side of this sheet

"EVEREADY" NO. 2356

Estimated Service at 70°F

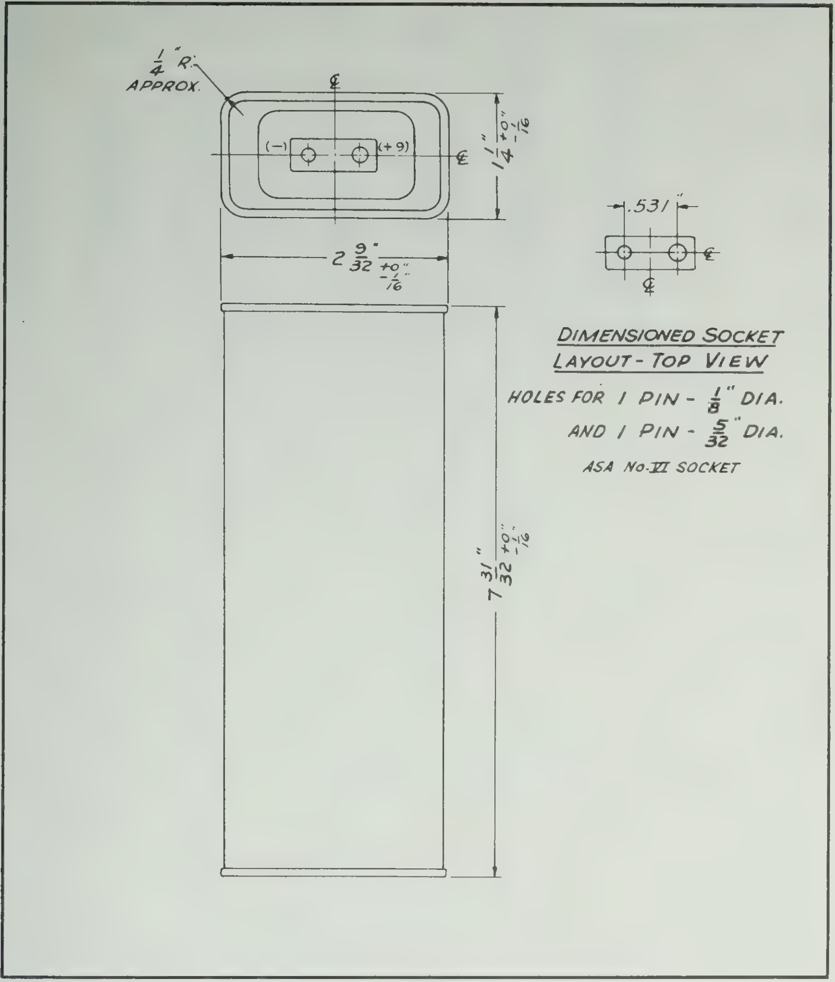
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 4.8V
4 hrs./day	15	435 hrs.
	25	240 hrs.
	36	170 hrs.
24 hrs./day	15	370 hrs.

"EVEREADY" NO. 2761 BATTERY

Type — Leclanché

NEDA Number—1608

Suggested Current Range: 0-30 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 9
Terminals	Socket
Average Weight	1 lb. 4 oz.
Volume	22.7 cubic inches
Cells	Six No. 240-5 Cathodic Envelope in series

For service information see reverse side of this sheet

"EVEREADY" NO. 2761

Estimated Hours Service at 70°F (Tentative)

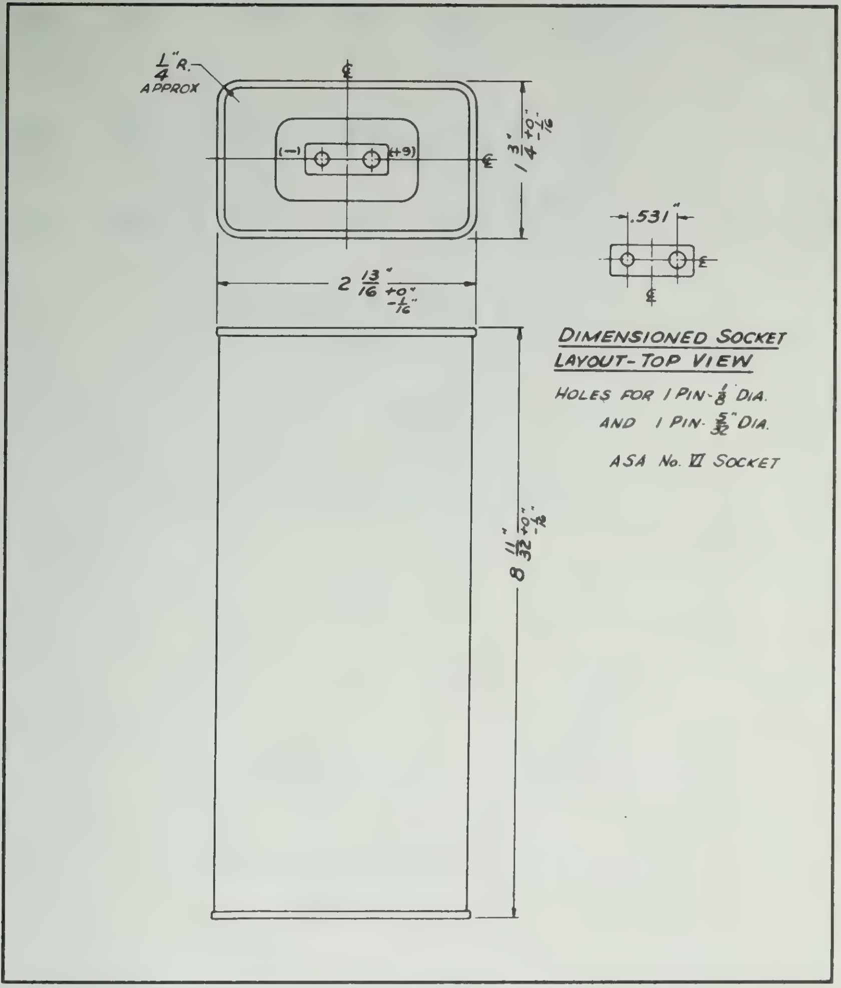
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 3.0V	4.8V	5.4V	6.0V	6.6V	7.2V
4 hrs./day	75	120						38
	100	90				57	45	18
24 hrs./day	25	360		335	290	247	180	135
	35	257	309	229	197	160	130	93
	50	180	200	143	120	100	82	56
	75	120	120	79	66	54	44	26
	100	90	84	49	42	36	30	16.2
	250	36	20	11.8	10	8.3	5	1.8
	500	18	8	4.5	3.5	2.2	1.1	0.8

"EVEREADY" NO. 2762 BATTERY

Type — Leclanché

NEDA Number — 1609

Suggested Current Range: 0-100 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 9
Terminals	Socket
Average Weight	2 lbs. 5 oz.
Volume	41.0 cubic inches
Cells	Six No. 250-5 Cathodic Envelope in series

For service information see reverse side of this sheet

"EVEREADY" NO. 2762

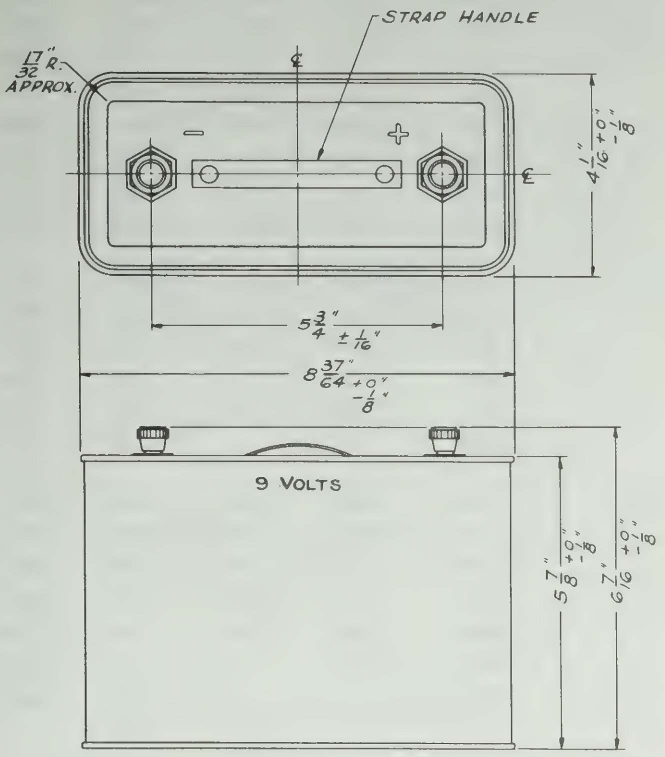
Estimated Hours Service at 70°F (Tentative)

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 4.8V	5.4V	6.0V	6.6V	7.2V
2 hrs/day	15	1250				
	50	375				
4 hrs/day	15	1325	1250	1150	775	600
	25	700	625	500	375	350
24 hrs/day	15	1200	1140	1050	750	575

"EVEREADY" NO. 716 BATTERY

Type — Leclanché

Suggested Current Range: 0-1000 milliamperes



TERMINAL POSTS - No. 8-32 THREAD

SPECIFICATIONS

Voltage Taps .... −, + 9
Terminals .... Insulated Screw
Average Weight .... 8 lbs. 8 oz.
Volume .... 205 cubic inches
Cells .... Twenty-four No. 60 (ASA "F")—
Four parallel strings of six in series

For service information see reverse side of this sheet

"EVEREADY" NO. 716

Estimated Hours Service at 70°F

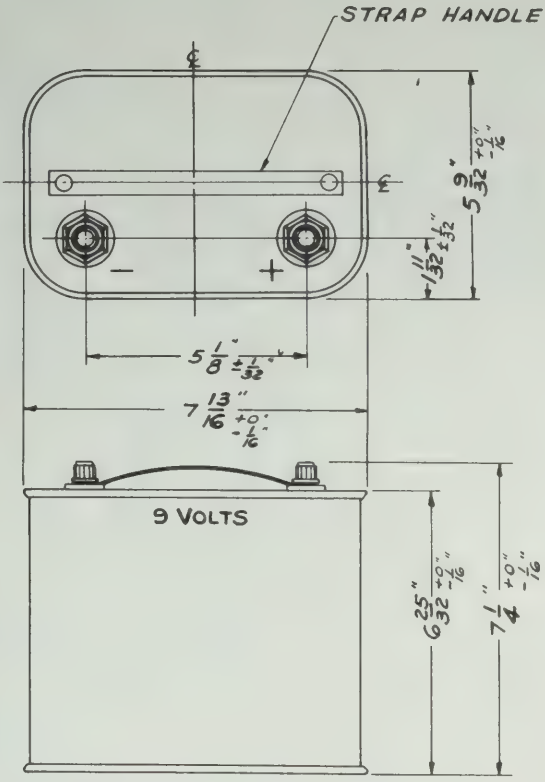
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 4.8V	5.4V	6.0V	6.6V	7.2V
2 hrs/day	20	1650	1550	1450	1400	1300
	40	900	840	780	720	640
	80	490	450	410	370	310
	120	340	310	280	250	200
	400	98	88	78	68	47
	800	41	37	33	27	16
	1200	23	20.5	18	13.8	6.8
4 hrs/day	40	940	880	840	760	680
	80	475	425	400	335	300
	120	320	275	260	235	180
	400	90	75	56	44	36
	800	35	28	22	16	12
	1200	19	15	12.3	8.5	4
24 hrs/day	20	2450	2350	2200	2000	1450
	40	1200	1050	940	880	620
	80	550	470	390	335	260
	120	350	275	250	220	155
	400	84	70	55	40	25
	800	33	26	20	13	8
	1200	18	14	10.5	6.5	4

"EVEREADY" NO. 1662 BATTERY

Type — Leclanché

NEDA Number — 913

Suggested Current Range: 0-1500 milliamperes



TERMINAL POSTS - No. 8-32 THREAD

SPECIFICATIONS

Voltage Taps	—, + 9
Terminals	Plastic Knurls
Average Weight	13 lbs. 8 oz.
Volume	290 cubic inches
Cells	Six No. 6 (ASA "6") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 1662

Estimated Hours Service at 70°F

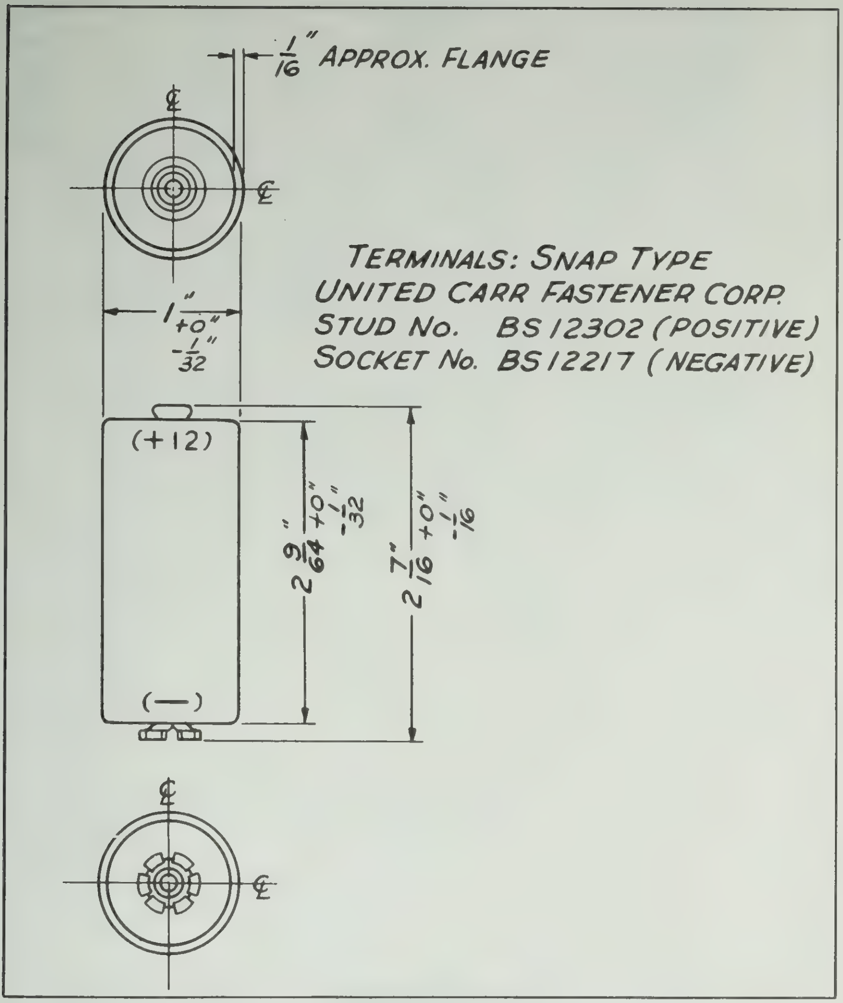
SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 5.1 V
Discharge for 2 periods of 1 hour each daily according to the following schedule: 1 hour discharge, 6 hour rest, 1 hour discharge, 16 hour rest. (Heavy Intermittent Test)	562	16	70

"EVEREADY" NO. 228 BATTERY

Type—Leclanché

NEDA Number—1810

Suggested Current Range—0-9 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 12
Terminals	Snap
Average Weight	2.3 oz.
Volume	1.68 cubic inches
Cells	Eight No. 127 in series

For service information see reverse side of this sheet

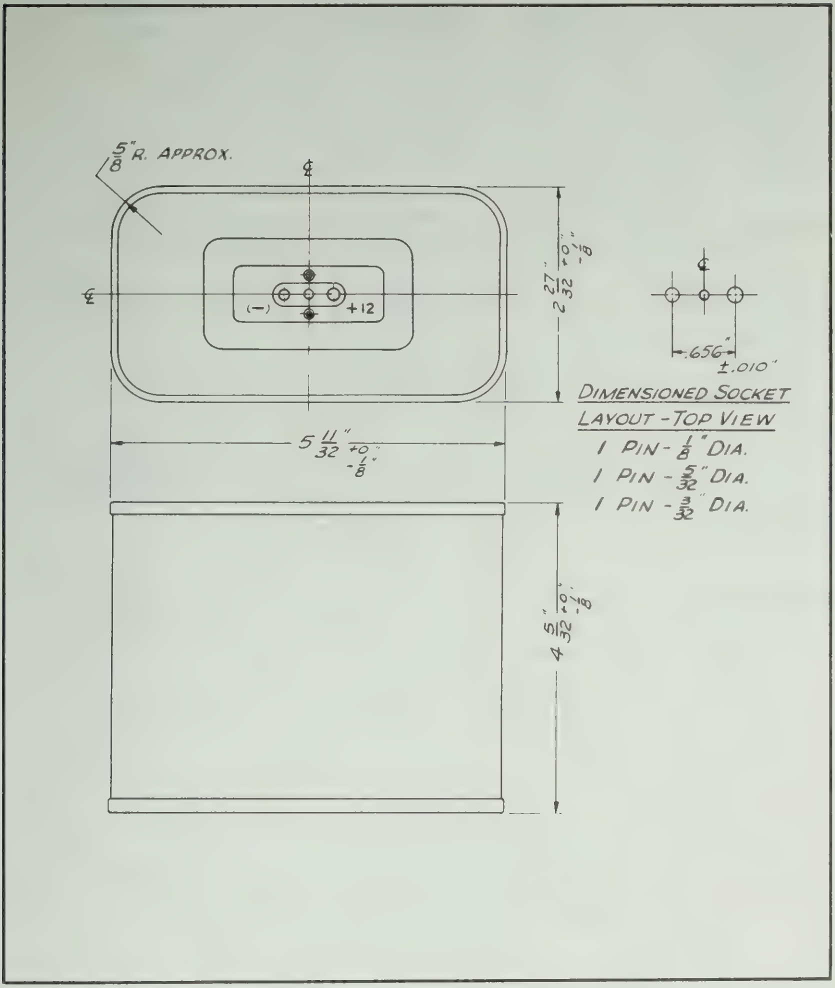
"EVEREADY" NO. 228

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 6.4V	CUT-OFF VOLTAGE 8.0V
2 hrs./day	5	150	130
2 hrs./day	7	117	98
2 hrs./day	11.5	68	57
2 hrs./day	16	44	33

"EVEREADY" NO. 2780 BATTERY

Type — Leclanché
NEDA Number — 923
Suggested Current Range: 0-500 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 12
Terminals	Socket
Average Weight	3 lbs. 8 oz.
Volume	63.1 cubic inches
Cells	Eight No. 260-6 Cathodic Envelope in series

For service information see reverse side of this sheet

"EVEREADY" NO. 2780

Estimated Service at 70°F

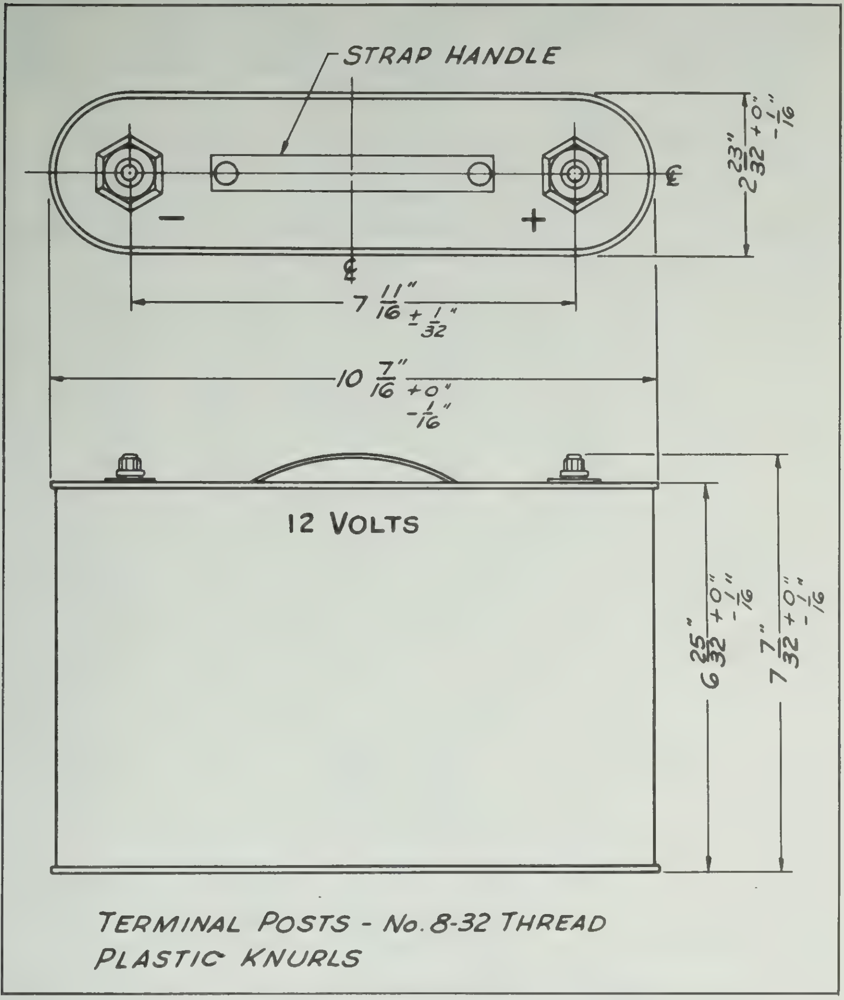
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 7.2V
24 hrs./day (Simulated Flasher Test — Transistorized Type)	8.5	1400	2500 hrs.
As Above	17	700	1180 hrs.
Discharge every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours (Railroad-Lantern Battery Test)	375	32	30 hrs.
24 hrs./day	20		1000 hrs.
	100		130 hrs.
	670		7 hrs.

"EVEREADY" NO. 1463 BATTERY

Type—Leclanché

NEDA Number—922

Suggested Current Range: 0-600 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 12
Terminals	Plastic Knurls
Average Weight	7 lbs. 11 oz.
Volume	199 cubic inches
Cells	Twenty-Four No. 55 (ASA "E")—Three parallel strings of eight in series

For service information see reverse side of this sheet

"EVEREADY" NO. 1463

Estimated Hours Service at 70°F (Tentative)

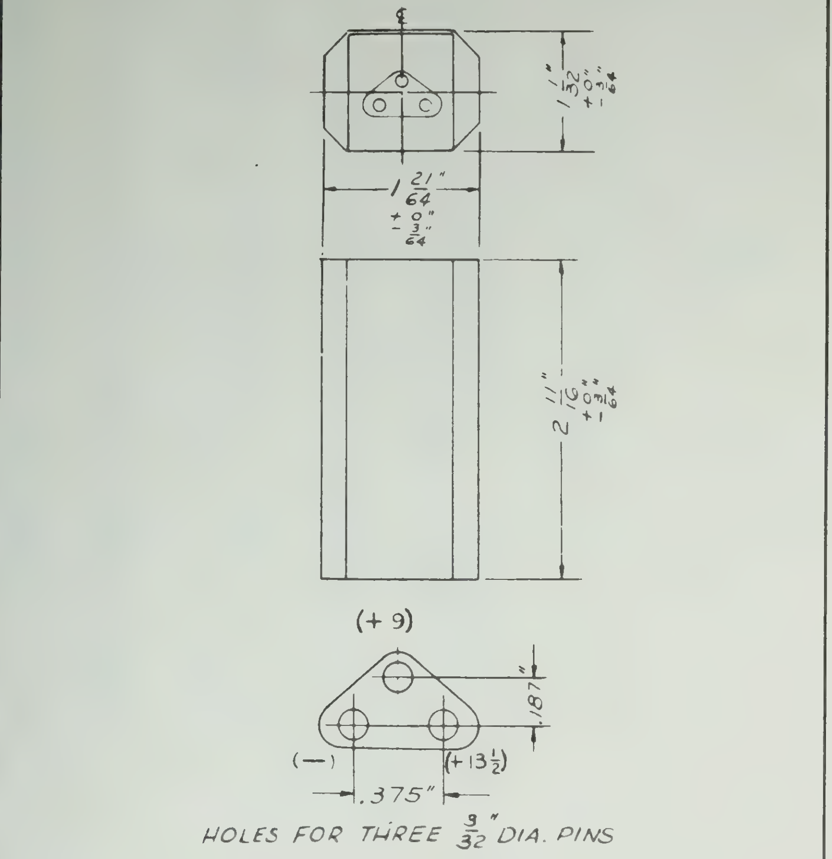
SCHEDULE	STARTING DRAINS (amperes)	LOAD	CUT-OFF VOLTAGE 4.0V	CUT-OFF VOLTAGE 7.2V	CUT-OFF VOLTAGE 8.0V
2 hrs. discharge 3 hrs. rest 2 hrs. discharge (per day)	1	12 ohms	25.5 hrs.	14.6 hrs.	12.7 hrs.
As above	2	6 ohms	10 hrs.	5.3 hrs.	3.2 hrs.

"EVEREADY" NO. 239 BATTERY

Type — Leclanché

NEDA Number — 1900

Suggested Current Range: 0-10 milliamperes


℄
$1\frac{1}{32}$" +0" −$\frac{3}{64}$
$1\frac{21}{64}$" +0" −$\frac{3}{64}$"
$2\frac{11}{16}$" +0" −$\frac{3}{64}$"
(+ 9)
.187"
(—)
(+ $13\frac{1}{2}$)
.375"
HOLES FOR THREE $\frac{3}{32}$" DIA. PINS

TOP VIEW OF SOCKET
SHOWING DIMENSIONS AND TERMINAL MARKINGS

SPECIFICATIONS

Voltage Taps	—, + 9, + 13.5
Terminals	Socket
Average Weight	3 oz.
Volume	3.61 cubic inches
Cells	Nine No. 135 (ASA F40) in series

For service information see reverse side of this sheet

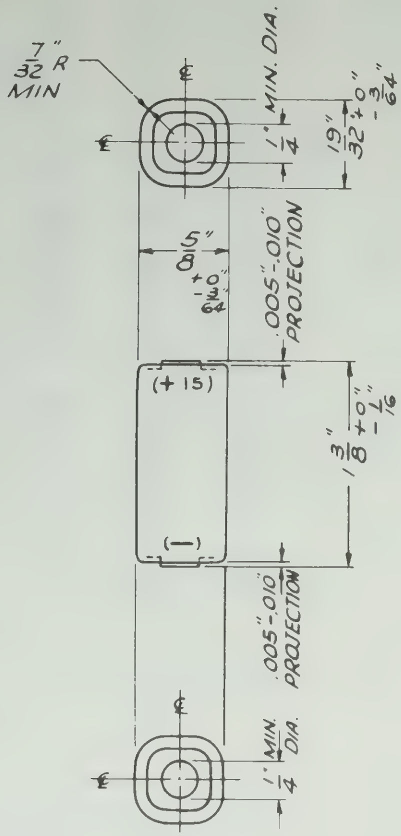
"EVEREADY" NO. 239

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		7.2V	8.1V	9.0V	9.9V	10.8V
2 hrs/day	0.5	920	890	850	810	730
	1	630	590	550	480	410
	5	150	140	130	98	70
	10	63	56	47	35	21
	20	20	18	15	11	5.4
	30	9.6	8.6	7.5	4.4	1.5
	35	7	6.2	5.4	2.7	0.8
12 hrs/day	0.5	1700	1600	1500	1250	930
	1	790	700	630	580	400
	5	110	92	85	68	45
	10	42	35	30	23	15
	20	16	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8
24 hrs/day	0.5	1700	1620	1550	1300	1000
	1	820	740	650	530	390
	5	105	90	75	55	36
	10	40	33	27	19	10.5
	20	14	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8

"EVEREADY" NO. 504 BATTERY

Type — Leclanché
NEDA Number — 220
Suggested Current Range: 0-1.5 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 15
Terminals	Flat Contacts
Average Weight	0.6 oz.
Volume	0.51 cubic inches
Cells	Ten No. 105 (ASA F15) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 504

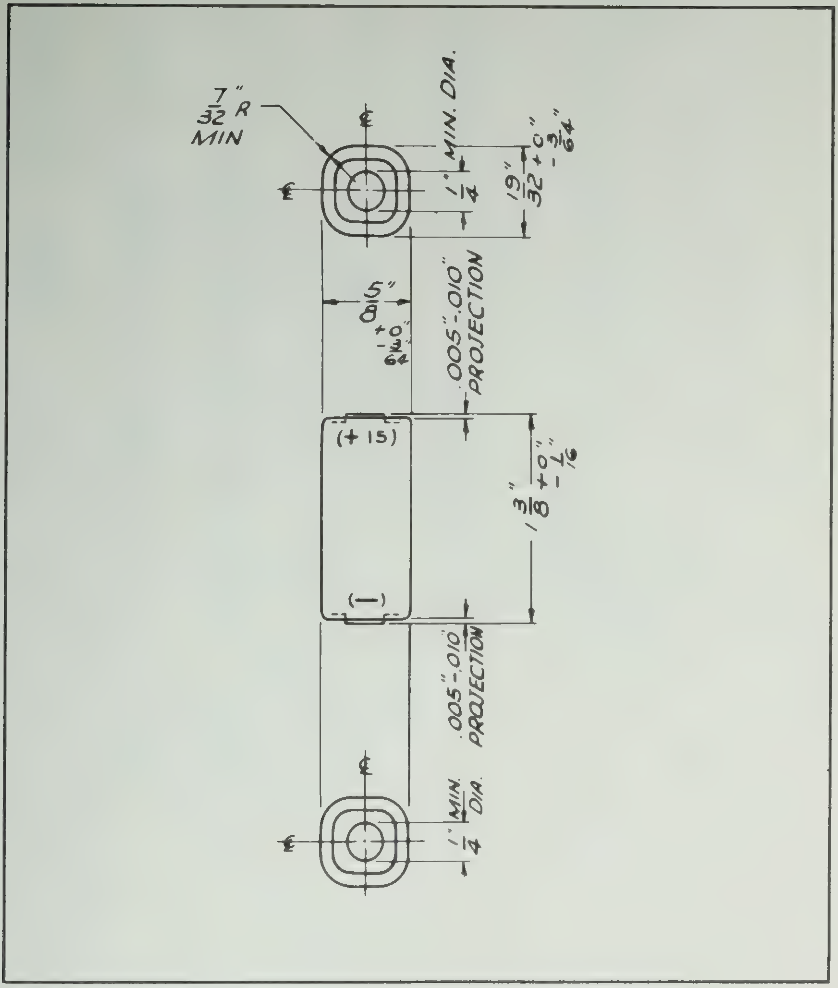
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 8V	9V	10V	11V	12V
2 hrs/day	0.02	2650	2550	2430	2250	1950
	0.05	1400	1310	1230	1150	1030
	0.1	780	740	670	620	560
	0.5	182	165	150	130	105
	1.0	82	74	66	55	34
	5.0	6.2	5.6	4.2	2.9	0.4
12 hrs/day	0.02	4100	3800	3600	3300	2900
	0.05	1950	1850	1775	1600	1450
	0.1	1050	970	910	840	760
	0.5	168	152	132	110	72
	1.0	66	59	49	35	15.4
24 hrs/day	0.02	4500	4200	3700	2990	2400
	0.05	2050	1900	1750	1500	1190
	0.1	1000	920	860	740	580
	0.5	155	140	125	107	74
	1.0	61	53	47	38	20.5
	5.0	4.4	3.5	3	1.9	0.28

"EVEREADY" NO. 504E BATTERY

Type — Leclanché

Suggested Current Range: 0-1.5 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 15
Terminals	Flat Contacts
Average Weight	0.6 oz.
Volume	0.51 cubic inches
Cells	Ten No. 105 (ASA F15) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 504E

Estimated Hours Service at 70°F

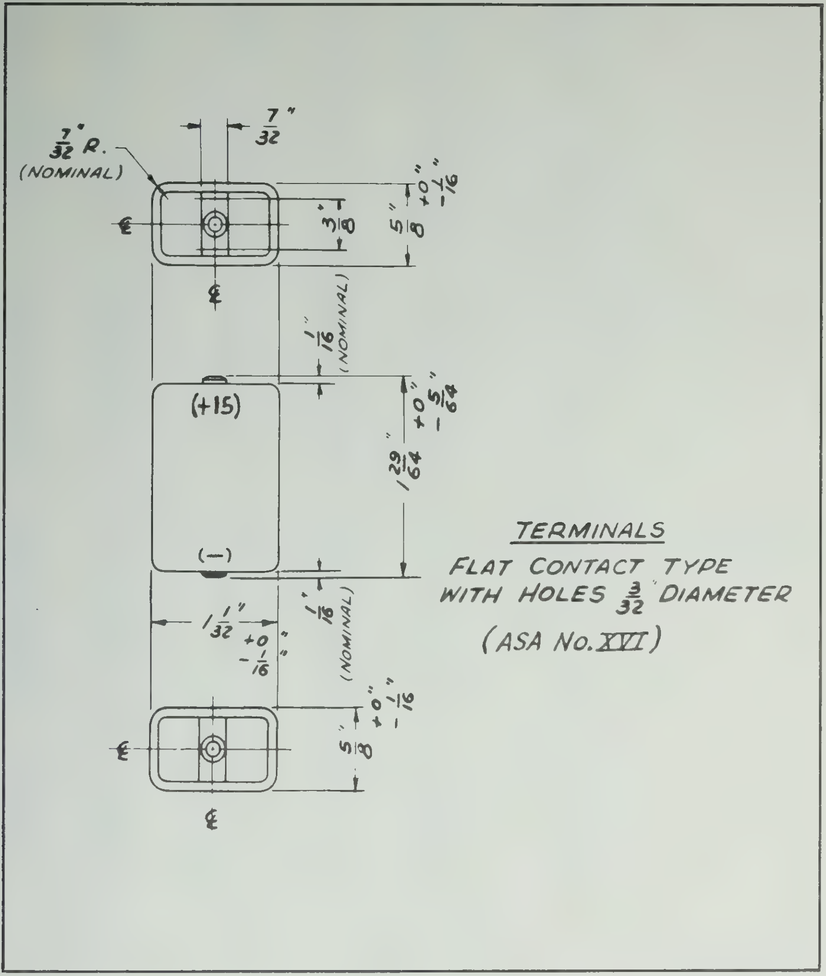
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 8V	9V	10V	11V	12V
2 hrs/day	0.02	2650	2550	2430	2250	1950
	0.05	1400	1310	1230	1150	1030
	0.1	780	740	670	620	560
	0.5	182	165	150	130	105
	1.0	82	74	66	55	34
	5.0	6.2	5.6	4.2	2.9	0.4
12 hrs/day	0.02	4100	3800	3600	3300	2900
	0.05	1950	1850	1775	1600	1450
	0.1	1050	970	910	840	760
	0.5	168	152	132	110	72
	1.0	66	59	49	35	15.4
24 hrs/day	0.02	4500	4200	3700	2990	2400
	0.05	2050	1900	1750	1500	1190
	0.1	1000	920	860	740	580
	0.5	155	140	125	107	74
	1.0	61	53	47	38	20.5
	5.0	4.4	3.5	3	1.9	0.28

"EVEREADY" NO. 411 BATTERY

Type — Leclanché

NEDA Number — 208

Suggested Current Range: 0-2.5 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 15
Terminals	Flat Contacts
Average Weight	0.95 oz.
Volume	0.95 cubic inches
Cells	Ten No. 112 (ASA F20) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 411

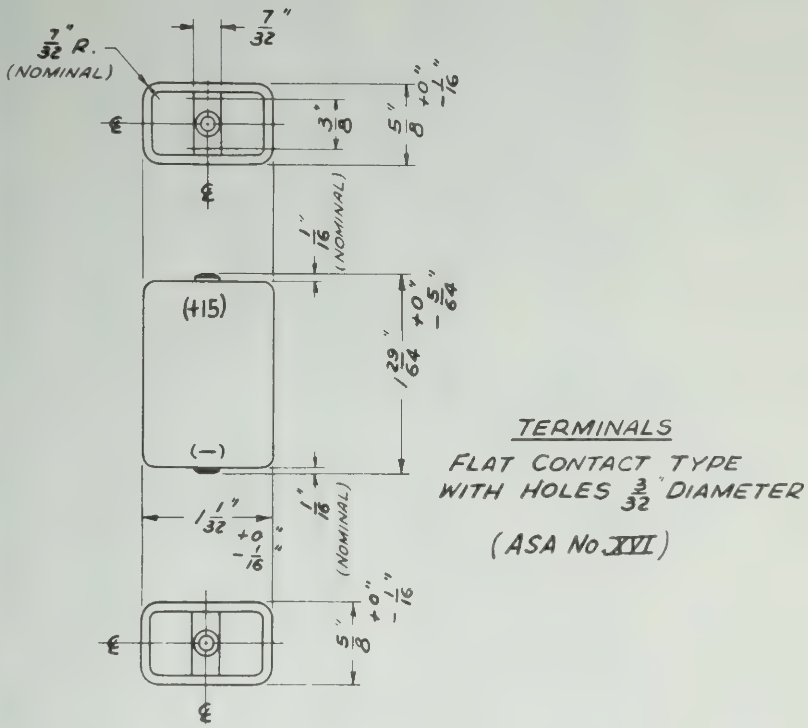
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		8V	9V	10V	11V	12V
2 hrs/day	0.1	1300	1265	1210	1130	1100
	0.2	770	730	700	660	610
	0.3	530	515	490	460	420
	0.5	320	310	295	275	250
	1.0	150	144	138	130	115
	2.0	74	68	64	59	50
	5.0	24	21	18	15	5
4 hrs/day	0.1	1650	1550	1500	1400	1330
	0.2	860	810	780	768	715
	0.3	570	530	510	490	460
	0.5	330	310	300	280	260
	1.0	155	148	140	130	115
	2.0	68	65	60	54	44
	5.0	22	18	14	10	4
12 hrs/day	0.1	1710	1615	1525	1430	1345
	0.2	810	780	740	705	645
	0.3	540	510	480	450	410
	0.5	320	295	275	255	220
	1.0	140	130	117	105	88
	2.0	62	53	45	40	32
	5.0	20	16	10	9	4
24 hrs/day	0.6	310	290	270	240	200
	1.0	135	120	110	100	67
	2.0	57	50	44	38	20
	5.0	16	13	10	9	4

"EVEREADY" NO. 411E BATTERY

Type — Leclanché

Suggested Current Range: 0-2.5 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 15
Terminals	Flat Contacts
Average Weight	0.95 oz.
Volume	0.95 cubic inches
Cells	Ten No. 112 (ASA F20) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 411E

Estimated Hours Service at 70°F

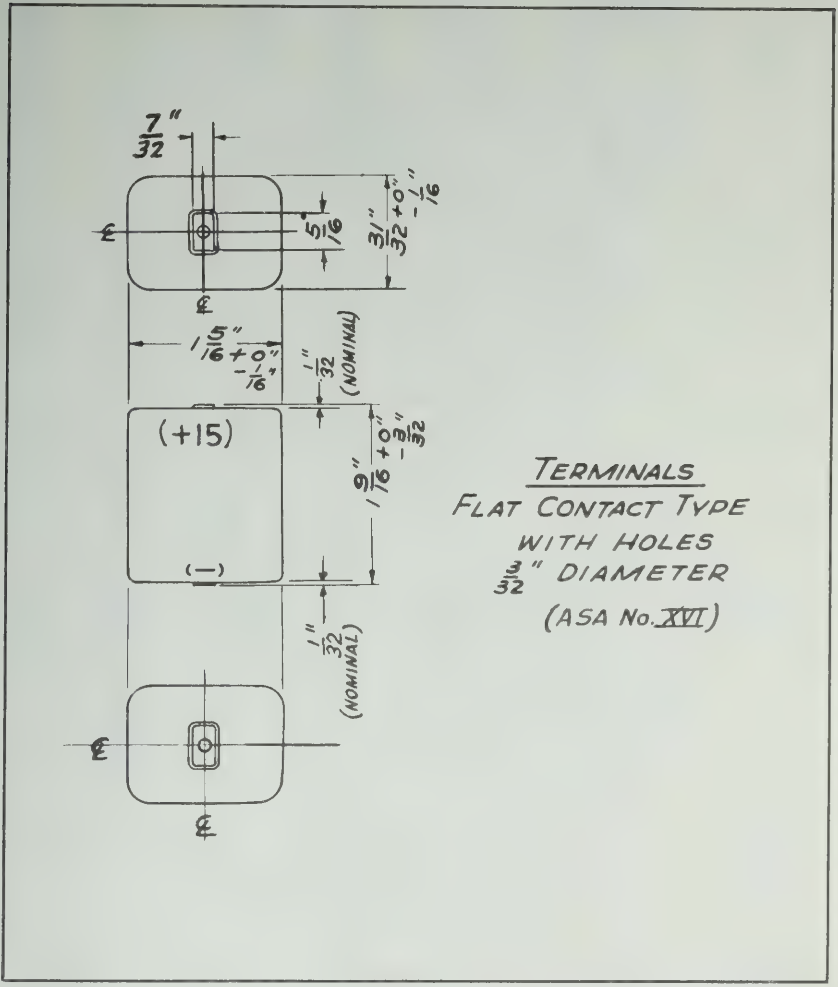
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		8V	9V	10V	11V	12V
2 hrs/day	0.1	1300	1265	1210	1130	1100
	0.2	770	730	700	660	610
	0.3	530	515	490	460	420
	0.5	320	310	295	275	250
	1.0	150	144	138	130	115
	2.0	74	68	64	59	50
	5.0	24	21	18	15	5
4 hrs/day	0.1	1650	1550	1500	1400	1330
	0.2	860	810	780	768	715
	0.3	570	530	510	490	460
	0.5	330	310	300	280	260
	1.0	155	148	140	130	115
	2.0	68	65	60	54	44
	5.0	22	18	14	10	4
12 hrs/day	0.1	1710	1615	1525	1430	1345
	0.2	810	780	740	705	645
	0.3	540	510	480	450	410
	0.5	320	295	275	255	220
	1.0	140	130	117	105	88
	2.0	62	53	45	40	32
	5.0	20	16	10	9	4
24 hrs/day	0.6	310	290	270	240	200
	1.0	135	120	110	100	67
	2.0	57	50	44	38	20
	5.0	16	13	10	9	4

"EVEREADY" NO. 417 BATTERY

Type — Leclanché

NEDA Number — 224

Suggested Current Range: 0-6 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 15
Terminals	Flat Contacts
Average Weight	1.8 oz.
Volume	1.87 cubic inches
Cells	Ten No. 132 (ASA F30) in series

For service information see reverse side of this sheet

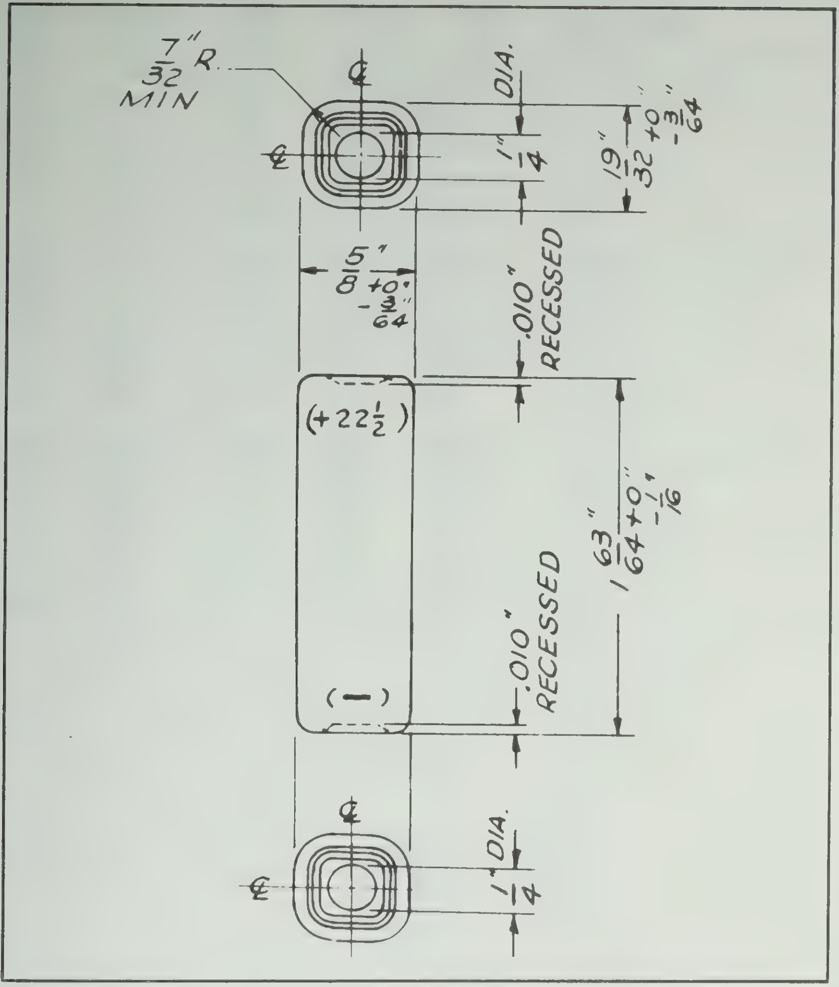
"EVEREADY" NO. 417

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 8V	9V	10V	11V	12V
2 hrs/day	0.5	720	680	630	560	460
	1.0	380	355	330	300	225
	5.0	60	55	48	39	28
	10	25	21	16.5	13	6.8
	20	7.5	6	4.5	2	0.8
4 hrs/day	0.2	1730	1675	1600	1470	1250
	0.5	760	730	660	590	490
	1.0	370	350	310	270	220
	5.0	59	54	45	35	25
	10	23	19	15	10	3.5
12 hrs/day	0.2	1900	1820	1700	1500	1175
	0.5	740	700	650	550	400
	1.0	360	330	300	240	170
	5.0	52	44	32	24	16
	10	19.5	13.5	10	6.5	3.5
24 hrs/day	0.1	4100	3550	3400	3100	2600
	0.5	780	700	620	540	390
	1.0	365	330	285	230	165
	5.0	50	40	30	22	14
	10	17.5	12.5	10	6.5	3.5
	20	5.5	4	3	2	0.8

"EVEREADY" NO. 505 BATTERY

Type — Leclanché
NEDA Number — 221
Suggested Current Range: 0-1.5 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 22.5
Terminals	Flat Recessed
Average Weight	0.8 oz.
Volume	0.74 cubic inches
Cells	Fifteen No. 105 (ASA F15) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 505

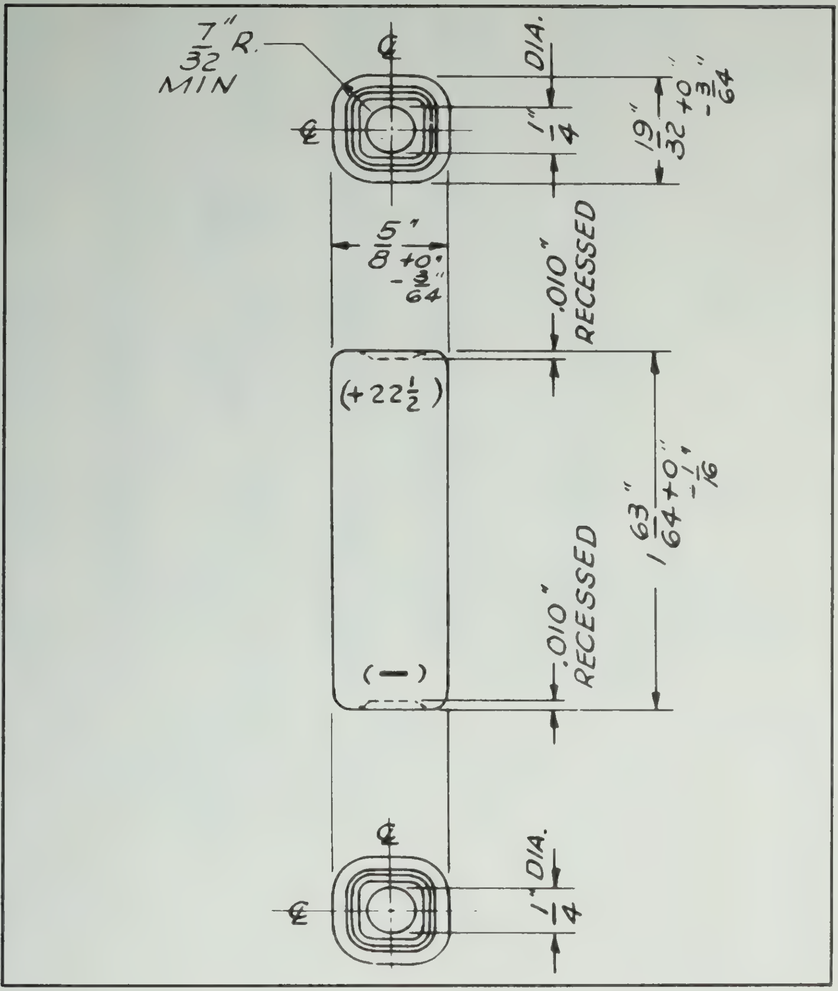
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 12.0V	13.5V	15.0V	16.5V	18.0V
2 hrs/day	0.02	2650	2550	2430	2250	1950
	0.05	1400	1310	1230	1150	1030
	0.1	780	740	670	620	560
	0.5	182	165	150	130	105
	1.0	82	74	66	55	34
	5.0	6.2	5.6	4.2	2.9	0.4
12 hrs/day	0.02	4100	3800	3600	3300	2900
	0.05	1950	1850	1775	1600	1450
	0.1	1050	970	910	840	760
	0.5	168	152	132	110	72
	1.0	66	59	49	35	15.4
24 hrs/day	0.02	4500	4200	3700	2990	2400
	0.05	2050	1900	1750	1500	1190
	0.1	1000	920	860	740	580
	0.5	155	140	125	107	74
	1.0	61	53	47	38	20.5
	5.0	4.4	3.5	3	1.9	0.28

"EVEREADY" NO. 505E BATTERY

Type — Leclanché

Suggested Current Range: 0-1.5 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 22.5
Terminals	Flat Recessed
Average Weight	0.8 oz.
Volume	0.74 cubic inches
Cells	Fifteen No. 105 (ASA F15) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 505E

Estimated Hours Service at 70°F

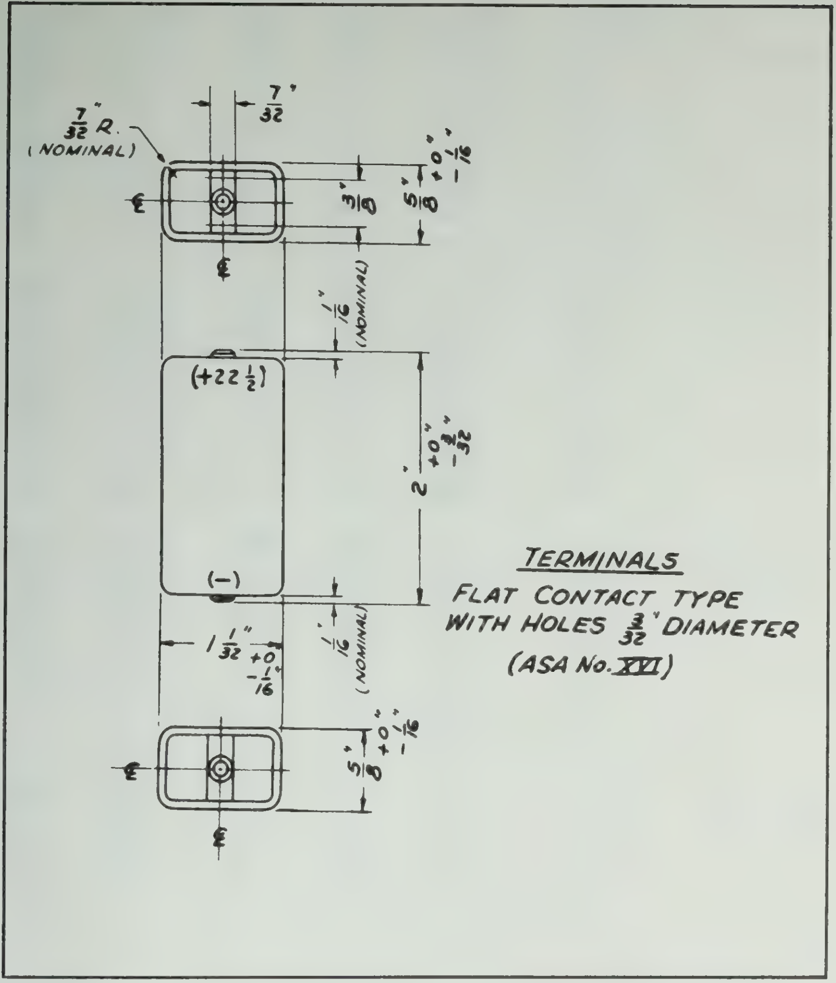
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		12.0V	13.5V	15.0V	16.5V	18.0V
2 hrs./day	0.02	2650	2550	2430	2250	1950
	0.05	1400	1310	1230	1150	1030
	0.1	780	740	670	620	560
	0.5	182	165	150	130	105
	1.0	82	74	66	55	34
	5.0	6.2	5.6	4.2	2.9	0.4
12 hrs./day	0.02	4100	3800	3600	3300	2900
	0.05	1950	1850	1775	1600	1450
	0.1	1050	970	910	840	760
	0.5	168	152	132	110	72
	1.0	66	59	49	35	15.4
24 hrs./day	0.02	4500	4200	3700	2990	2400
	0.05	2050	1900	1750	1500	1190
	0.1	1000	920	860	740	580
	0.5	155	140	125	107	74
	1.0	61	53	47	38	20.5
	5.0	4.4	3.5	3	1.9	0.28

"EVEREADY" NO. 412 BATTERY

Type — Leclanché

NEDA Number — 215

Suggested Current Range: 0-2.5 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 22.5
Terminals	Flat Contacts
Average Weight	1.3 oz.
Volume	1.31 cubic inches
Cells	Fifteen No. 112 (ASA F20) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 412

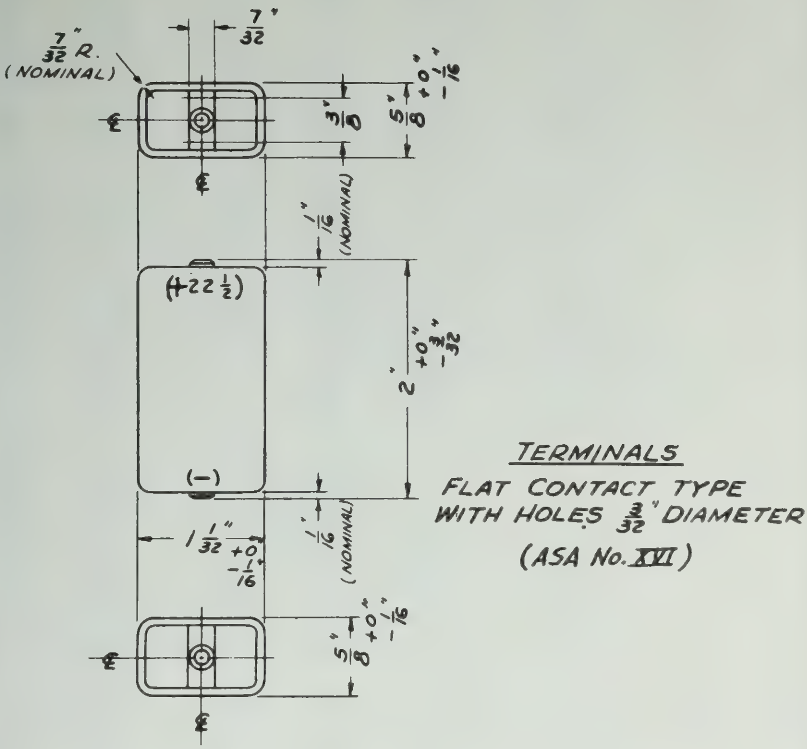
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 12.0V	13.5V	15.0V	16.5V	18.0V
2 hrs./day	0.1	1300	1265	1210	1130	1100
	0.2	770	730	700	660	610
	0.3	530	515	490	460	420
	0.5	320	310	295	275	250
	1.0	150	144	138	130	115
	2.0	74	68	64	59	50
	5.0	24	21	18	15	5
4 hrs./day	0.1	1650	1550	1500	1400	1330
	0.2	860	810	780	768	715
	0.3	570	530	510	490	460
	0.5	330	310	300	280	260
	1.0	155	148	140	130	115
	2.0	68	65	60	54	44
	5.0	22	18	14	10	4
12 hrs./day	0.1	1710	1615	1525	1430	1345
	0.2	810	780	740	705	645
	0.3	540	510	480	450	410
	0.5	320	295	275	255	220
	1.0	140	130	117	105	88
	2.0	62	53	45	40	32
	5.0	20	16	10	9	4
24 hrs./day	0.6	310	290	270	240	200
	1.0	135	120	110	100	67
	2.0	57	50	44	38	20
	5.0	16	13	10	9	4

"EVEREADY" NO. 412E BATTERY

Type — Leclanché

Suggested Current Range: 0-2.5 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 22.5
Terminals	Flat Contacts
Average Weight	1.3 oz.
Volume	1.31 cubic inches
Cells	Fifteen No. 112 (ASA F20) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 412E

Estimated Hours Service at 70°F

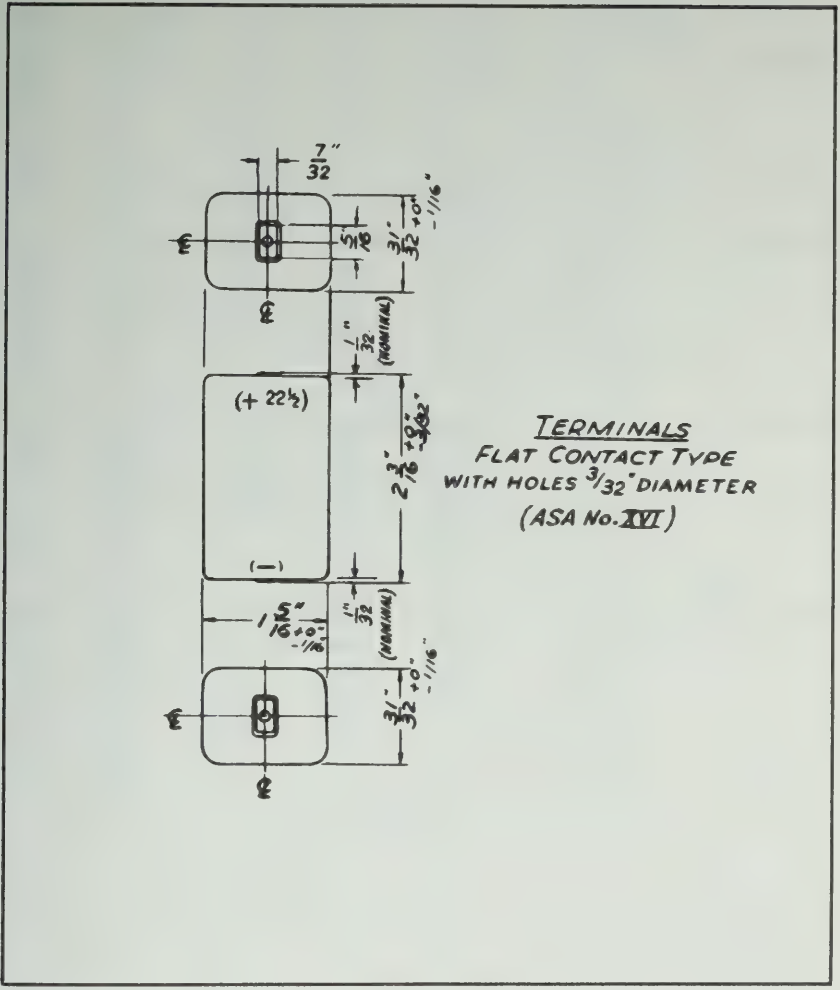
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		12.0V	13.5V	15.0V	16.5V	18.0V
2 hrs./day	0.1	1300	1265	1210	1130	1100
	0.2	770	730	700	660	610
	0.3	530	515	490	460	420
	0.5	320	310	295	275	250
	1.0	150	144	138	130	115
	2.0	74	68	64	59	50
	5.0	24	21	18	15	5
4 hrs./day	0.1	1650	1550	1500	1400	1330
	0.2	860	810	780	768	715
	0.3	570	530	510	490	460
	0.5	330	310	300	280	260
	1.0	155	148	140	130	115
	2.0	68	65	60	54	44
	5.0	22	18	14	10	4
12 hrs./day	0.1	1710	1615	1525	1430	1345
	0.2	810	780	740	705	645
	0.3	540	510	480	450	410
	0.5	320	295	275	255	220
	1.0	140	130	117	105	88
	2.0	62	53	45	40	32
	5.0	20	16	10	9	4
24 hrs./day	0.6	310	290	270	240	200
	1.0	135	120	110	100	67
	2.0	57	50	44	38	20
	5.0	16	13	10	9	4

"EVEREADY" NO. 420 BATTERY

Type — Leclanché

NEDA Number — 225

Suggested Current Range: 0-6 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 22.5
Terminals	Flat Contacts
Average Weight	2.5 oz.
Volume	2.66 cubic inches
Cells	Fifteen No. 132 (ASA F30) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 420

Estimated Hours Service at 70°F

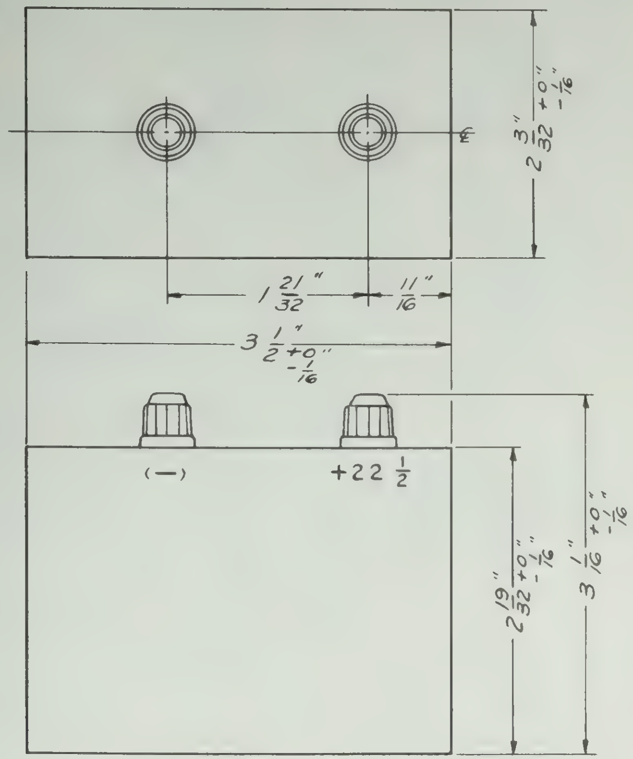
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		12.0V	13.5V	15.0V	16.5V	18.0V
2 hrs./day	0.5	720	680	630	560	460
	1.0	380	355	330	300	225
	5.0	60	55	48	39	28
	10	25	21	16.5	13	6.8
	20	7.5	6	4.5	2	0.8
4 hrs./day	0.2	1730	1675	1600	1470	1250
	0.5	760	730	660	590	490
	1.0	370	350	310	270	220
	5.0	59	54	45	35	25
	10	23	19	15	10	3.5
12 hrs./day	0.2	1900	1820	1700	1500	1175
	0.5	740	700	650	550	400
	1.0	360	330	300	240	170
	5.0	52	44	32	24	16
	10	19.5	13.5	10	6.5	3.5
24 hrs./day	0.1	4100	3550	3400	3100	2600
	0.5	780	700	620	540	390
	1.0	365	330	285	230	165
	5.0	50	40	30	22	14
	10	17.5	12.5	10	6.5	3.5
	20	5.5	4	3	2	0.8

"EVEREADY" NO. 763 BATTERY

Type — Leclanché

NEDA Number — 710

Suggested Current Range: 0-40 milliamperes


℄
$2\frac{3}{32}$" +0" −1/16
$1\frac{21}{32}$"
11/16"
$3\frac{1}{2}$" +0" −1/16
(—)
+22 ½
$2\frac{19}{32}$" +0" −1/16
$3\frac{1}{16}$" +0" −1/16

TERMINAL POSTS - No. 8-32 THREAD

SPECIFICATIONS

Voltage Taps	—, + 22.5
Terminals	Plastic Knurls
Average Weight	14 oz.
Volume	18.5 cubic inches
Cells	Fifteen No. 163 (ASA F80) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 763

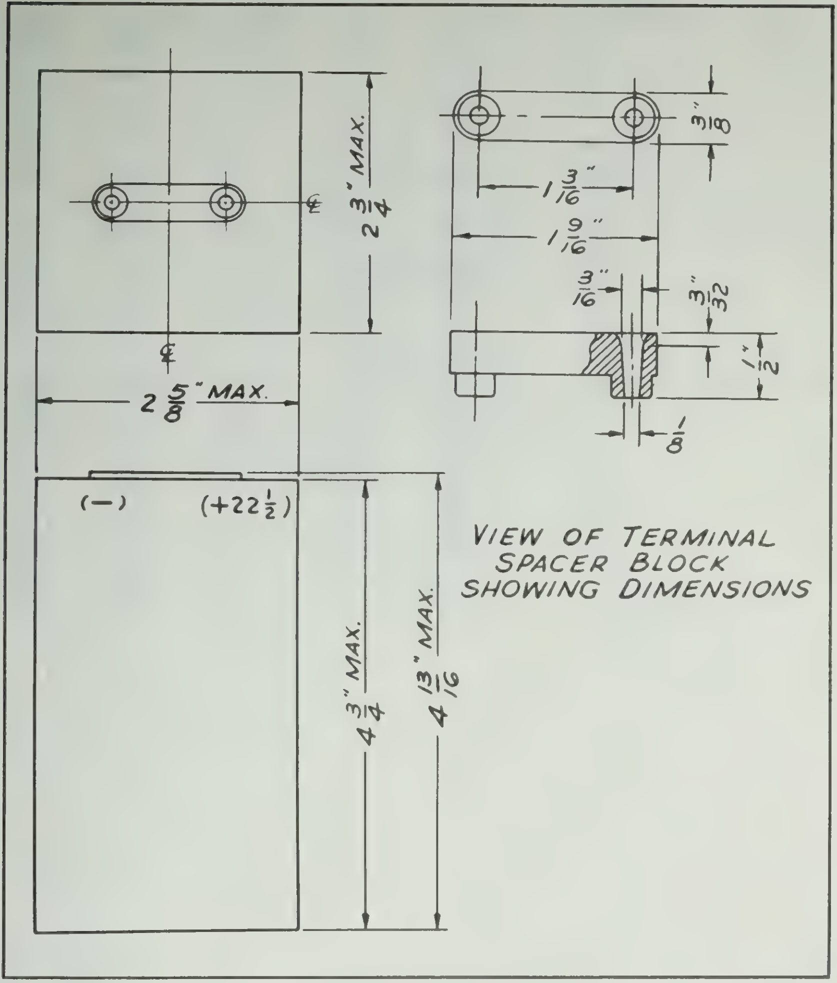
Estimated Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 15 V
4 hrs./day	4.5	5000	505 hours
	9	2500	225 hours
	18	1250	85 hours
24 hrs./day	4.5	5000	385 hours

"EVEREADY" NO. 708 BATTERY

Type — Leclanché

Suggested Current Range: 0-50 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 22.5
Terminals	Socket
Average Weight	1 lb. 11 oz.
Volume	34.2 cubic inches
Cells	Fifteen No. 30 (ASA "B") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 708

Estimated Hours Service at 70°F

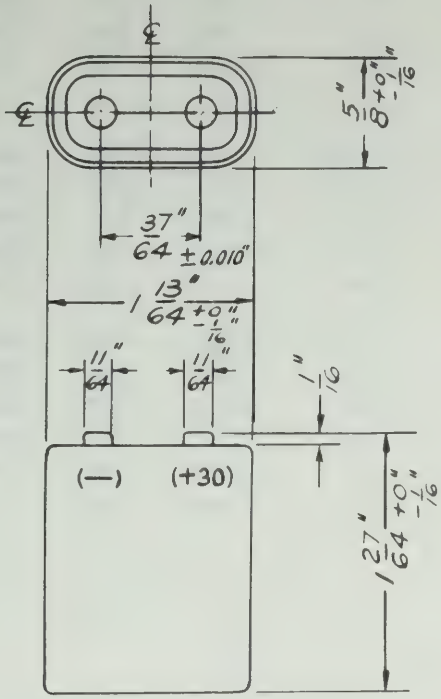
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 12.0V	13.5V	15.0V	16.5V	18.0V
2 hrs/day	5	420	380	340	290	250
	10	220	190	155	130	107
	20	110	90	75	57	45
	50	37	30	24	18	13.5
	100	14.5	11.5	9	6.2	4.5
4 hrs/day	5	480	450	410	330	265
	10	240	215	190	150	100
	20	110	90	75	55	40
	50	28	22	18.5	14	7
24 hrs/day	1	3040	2990	2920	2600	1850
	5	610	530	440	390	300
	10	205	170	130	110	80
	20	87	70	50	37	27
	50	26	20	13	9	6
	100	10	7.5	4.5	3	2.2
	300	1.9	1.3	0.7	0.3	0.1

"EVEREADY" NO. 506 BATTERY

Type — Leclanché

NEDA Number — 223

Suggested Current Range: 0-1.5 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 30
Terminals	Flat Contacts
Average Weight	0.9 oz.
Volume	1.03 cubic inches
Cells	Twenty No. 105 (ASA F15) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 506

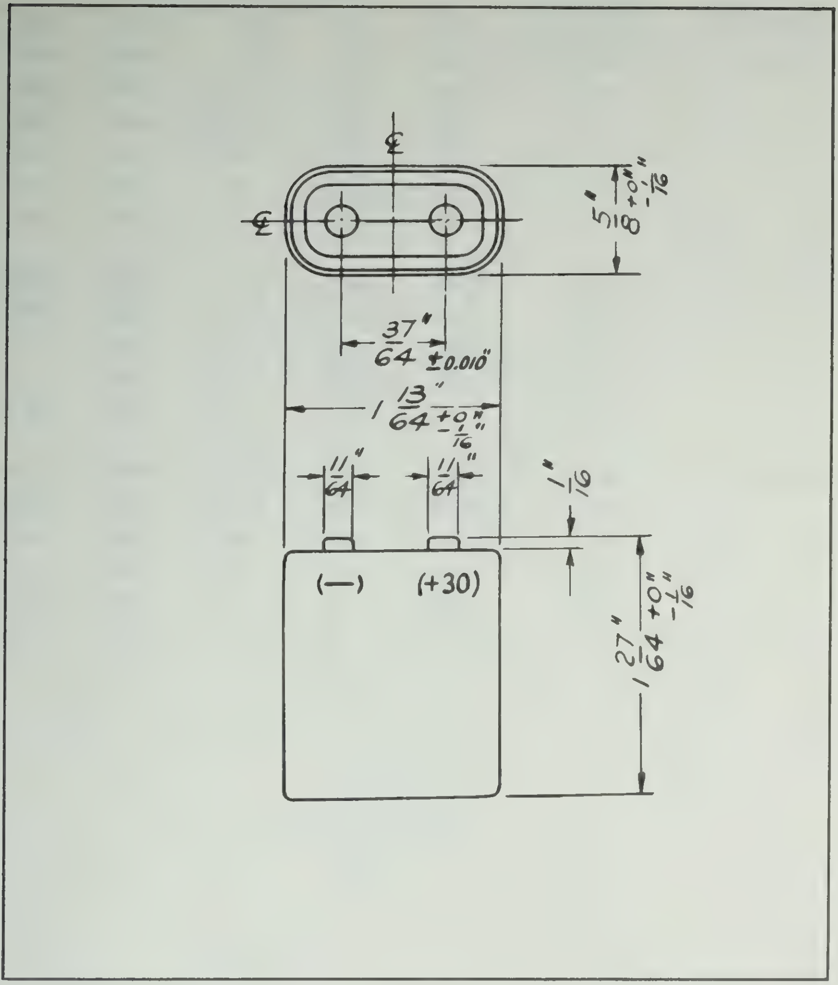
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 16V	18V	20V	22V	24V
2 hrs/day	0.02	2650	2550	2430	2250	1950
	0.05	1400	1310	1230	1150	1030
	0.1	780	740	670	620	560
	0.5	182	165	150	130	105
	1.0	82	74	66	55	34
	5.0	6.2	5.6	4.2	2.9	0.4
12 hrs/day	0.02	4100	3800	3600	3300	2900
	0.05	1950	1850	1775	1600	1450
	0.1	1050	970	910	840	760
	0.5	168	152	132	110	72
	1.0	66	59	49	35	15.4
24 hrs/day	0.02	4500	4200	3700	2990	2400
	0.05	2050	1900	1750	1500	1190
	0.1	1000	920	860	740	580
	0.5	155	140	125	107	74
	1.0	61	53	47	38	20.5
	5.0	4.4	3.5	3	1.9	0.28

"EVEREADY" NO. 506E BATTERY

Type — Leclanché

Suggested Current Range: 0-1.5 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 30
Terminals	Flat Contacts
Average Weight	0.9 oz.
Volume	1.03 cubic inches
Cells	Twenty No. 105 (ASA F15) in series

For service information see reverse side of this sheet

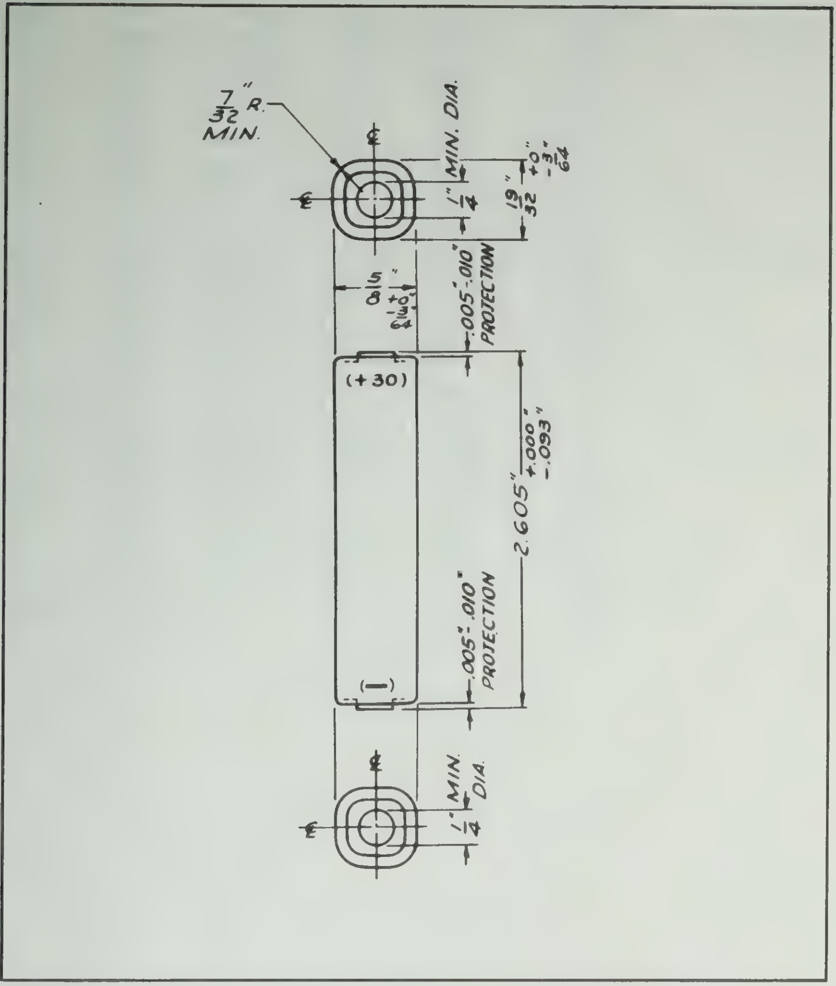
"EVEREADY" NO. 506E

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		16V	18V	20V	22V	24V
2 hrs/day	0.02	2650	2550	2430	2250	1950
	0.05	1400	1310	1230	1150	1030
	0.1	780	740	670	620	560
	0.5	182	165	150	130	105
	1.0	82	74	66	55	34
	5.0	6.2	5.6	4.2	2.9	0.4
12 hrs/day	0.02	4100	3800	3600	3300	2900
	0.05	1950	1850	1775	1600	1450
	0.1	1050	970	910	840	760
	0.5	168	152	132	110	72
	1.0	66	59	49	35	15.4
24 hrs/day	0.02	4500	4200	3700	2990	2400
	0.05	2050	1900	1750	1500	1190
	0.1	1000	920	860	740	580
	0.5	155	140	125	107	74
	1.0	61	53	47	38	20.5
	5.0	4.4	3.5	3	1.9	0.28

"EVEREADY" NO. 507 BATTERY

Type — Leclanché
NEDA Number — 222
Suggested Current Range: 0-1.5 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 30
Terminals	Flat Contacts
Average Weight	0.9 oz.
Volume	0.97 cubic inches
Cells	Twenty No. 105 (ASA F15) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 507

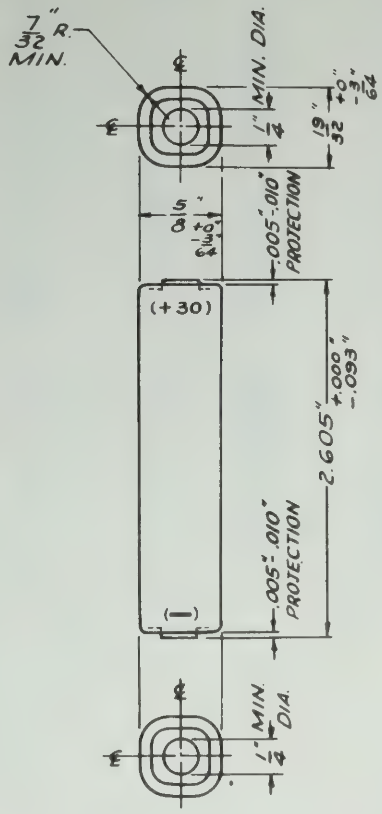
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 16V	18V	20V	22V	24V
2 hrs/day	0.02	2650	2550	2430	2250	1950
	0.05	1400	1310	1230	1150	1030
	0.1	780	740	670	620	560
	0.5	182	165	150	130	105
	1.0	82	74	66	55	34
	5.0	6.2	5.6	4.2	2.9	0.4
12 hrs/day	0.02	4100	3800	3600	3300	2900
	0.05	1950	1850	1775	1600	1450
	0.1	1050	970	910	840	760
	0.5	168	152	132	110	72
	1.0	66	59	49	35	15.4
24 hrs/day	0.02	4500	4200	3700	2990	2400
	0.05	2050	1900	1750	1500	1190
	0.1	1000	920	860	740	580
	0.5	155	140	125	107	74
	1.0	61	53	47	38	20.5
	5.0	4.4	3.5	3	1.9	0.28

"EVEREADY" NO. 507E BATTERY

Type — Leclanché

Suggested Current Range: 0-1.5 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 30
Terminals	Flat Contacts
Average Weight	0.9 oz.
Volume	0.97 cubic inches
Cells	Twenty No. 105 (ASA F15) in series

For service information see reverse side of this sheet

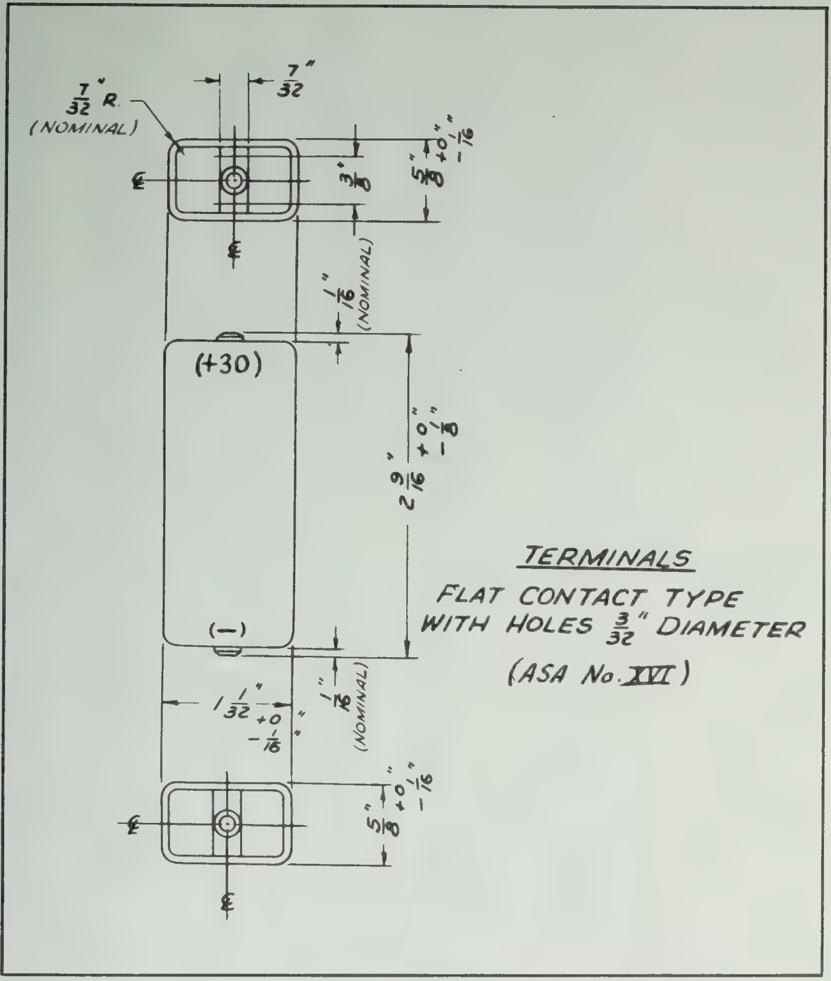
"EVEREADY" NO. 507E

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 16V	18V	20V	22V	24V
2 hrs/day	0.02	2650	2550	2430	2250	1950
	0.05	1400	1310	1230	1150	1030
	0.1	780	740	670	620	560
	0.5	182	165	150	130	105
	1.0	82	74	66	55	34
	5.0	6.2	5.6	4.2	2.9	0.4
12 hrs/day	0.02	4100	3800	3600	3300	2900
	0.05	1950	1850	1775	1600	1450
	0.1	1050	970	910	840	760
	0.5	168	152	132	110	72
	1.0	66	59	49	35	15.4
24 hrs/day	0.02	4500	4200	3700	2990	2400
	0.05	2050	1900	1750	1500	1190
	0.1	1000	920	860	740	580
	0.5	155	140	125	107	74
	1.0	61	53	47	38	20.5
	5.0	4.4	3.5	3	1.9	0.28

"EVEREADY" NO. 413 BATTERY

Type — Leclanché
NEDA Number — 210
Suggested Current Range: 0-2.5 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 30
Terminals	Flat Contacts
Average Weight	1.6 oz.
Volume	1.59 cubic inches
Cells	Twenty No. 112 (ASA F20) in series

For service information see reverse side of this sheet

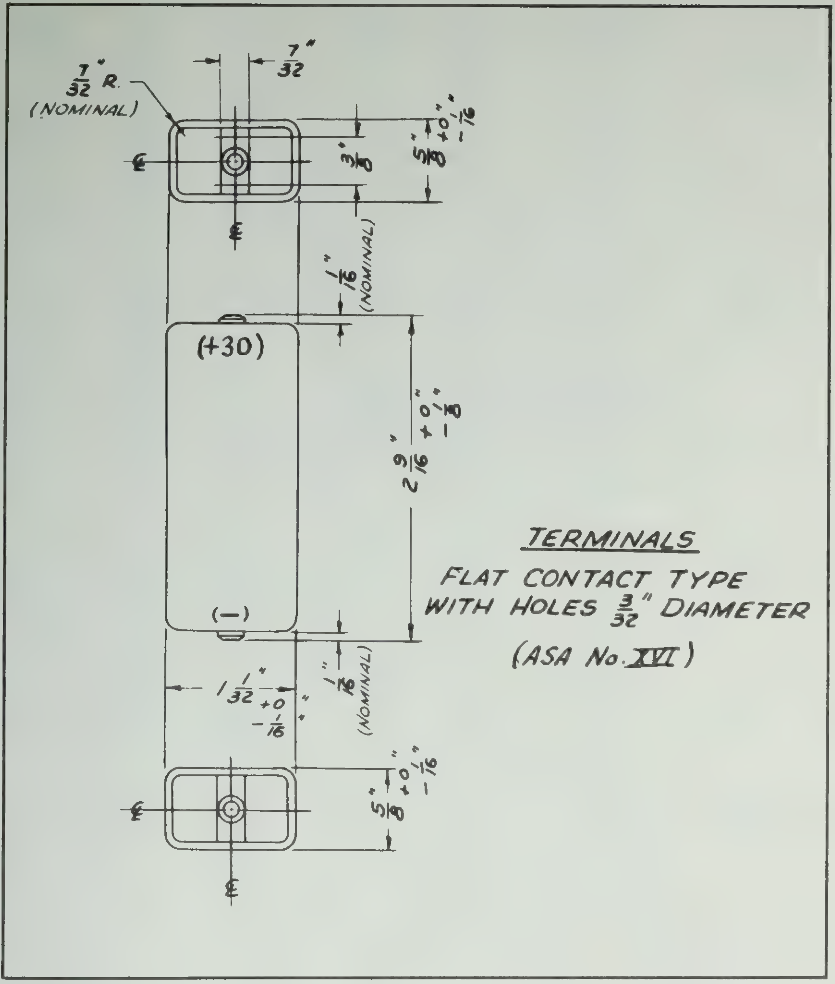
"EVEREADY" NO. 413

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		16V	18V	20V	22V	24V
2 hrs/day	0.1	1300	1265	1210	1130	1100
	0.2	770	730	700	660	610
	0.3	530	515	490	460	420
	0.5	320	310	295	275	250
	1.0	150	144	138	130	115
	2.0	74	68	64	59	50
	5.0	24	21	18	15	5
4 hrs/day	0.1	1650	1550	1500	1400	1330
	0.2	860	810	780	768	715
	0.3	570	530	510	490	460
	0.5	330	310	300	280	260
	1.0	155	148	140	130	115
	2.0	68	65	60	54	44
	5.0	22	18	14	10	4
12 hrs/day	0.1	1710	1615	1525	1430	1345
	0.2	810	780	740	705	645
	0.3	540	510	480	450	410
	0.5	320	295	275	255	220
	1.0	140	130	117	105	88
	2.0	62	53	45	40	32
	5.0	20	16	10	9	4
24 hrs/day	0.6	310	290	270	240	200
	1.0	135	120	110	100	67
	2.0	57	50	44	38	20
	5.0	16	13	10	9	4

"EVEREADY" NO. 413E BATTERY

Type — Leclanché
Suggested Current Range: 0-2.5 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 30
Terminals	Flat Contacts
Average Weight	1.6 oz.
Volume	1.59 cubic inches
Cells	Twenty No. 112 (ASA F20) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 413E

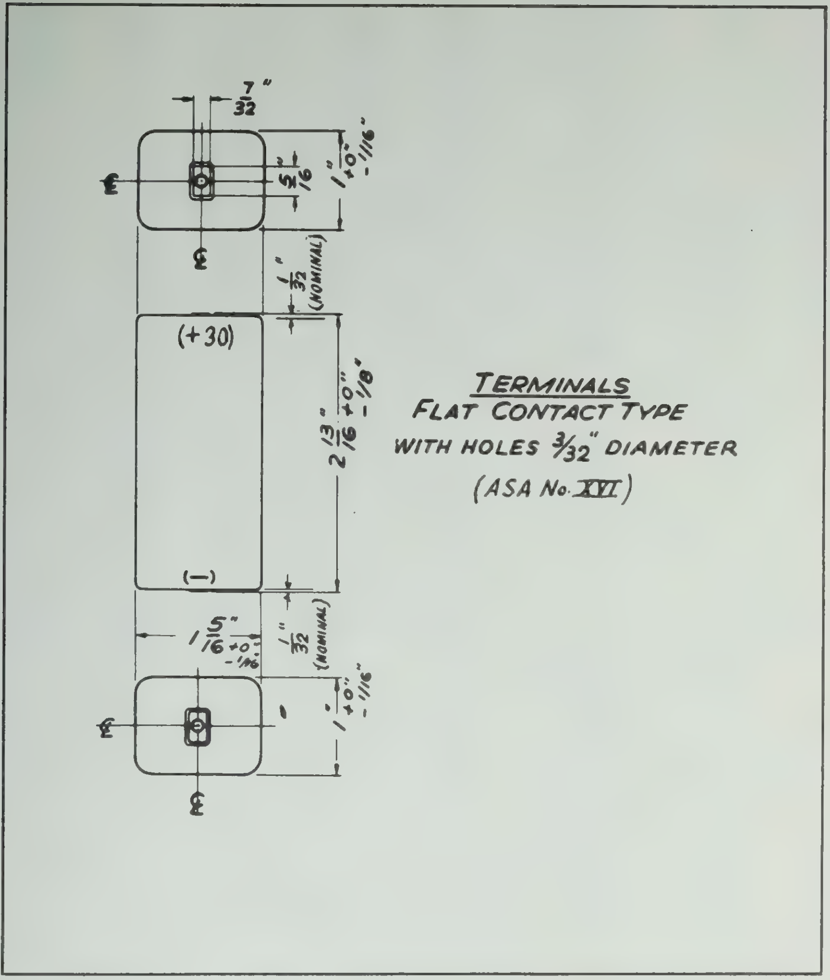
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 16V	18V	20V	22V	24V
2 hrs/day	0.1	1300	1265	1210	1130	1100
	0.2	770	730	700	660	610
	0.3	530	515	490	460	420
	0.5	320	310	295	275	250
	1.0	150	144	138	130	115
	2.0	74	68	64	59	50
	5.0	24	21	18	15	5
4 hrs/day	0.1	1650	1550	1500	1400	1330
	0.2	860	810	780	768	715
	0.3	570	530	510	490	460
	0.5	330	310	300	280	260
	1.0	155	148	140	130	115
	2.0	68	65	60	54	44
	5.0	22	18	14	10	4
12 hrs/day	0.1	1710	1615	1525	1430	1345
	0.2	810	780	740	705	645
	0.3	540	510	480	450	410
	0.5	320	295	275	255	220
	1.0	140	130	117	105	88
	2.0	62	53	45	40	32
	5.0	20	16	10	9	4
24 hrs/day	0.6	310	290	270	240	200
	1.0	135	120	110	100	67
	2.0	57	50	44	38	20
	5.0	16	13	10	9	4

"EVEREADY" NO. 430 BATTERY

Type — Leclanché

Suggested Current Range: 0-6 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 30
Terminals	Flat Contacts
Average Weight	3.2 oz.
Volume	3.56 cubic inches
Cells	Twenty No. 132 (ASA F30) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 430

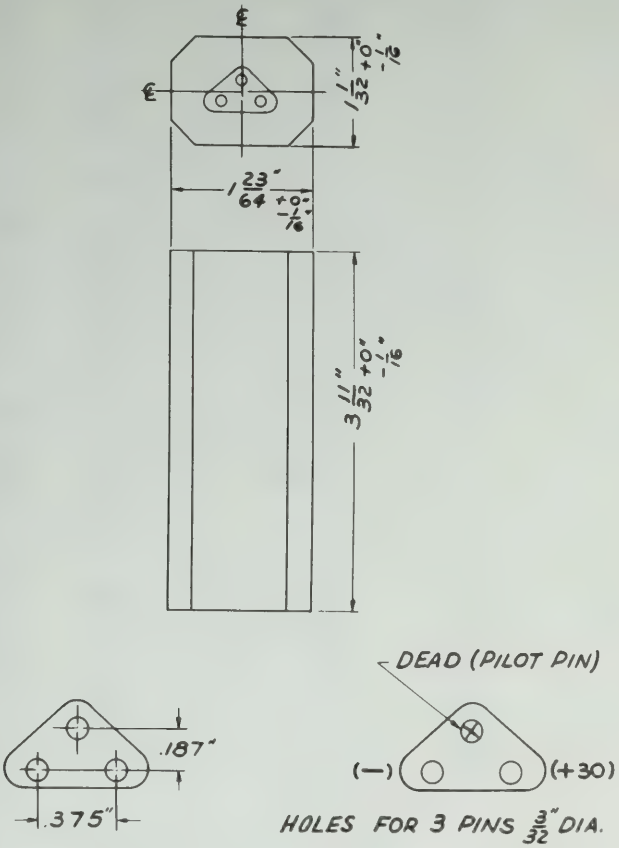
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		16V	18V	20V	22V	24V
2 hrs/day	0.5	720	680	630	560	460
	1.0	380	355	330	300	225
	5.0	60	55	48	39	28
	10	25	21	16.5	13	6.8
	20	7.5	6	4.5	2	0.8
4 hrs/day	0.2	1730	1675	1600	1470	1250
	0.5	760	730	660	590	490
	1.0	370	350	310	270	220
	5.0	59	54	45	35	25
	10	23	19	15	10	3.5
12 hrs/day	0.2	1900	1820	1700	1500	1175
	0.5	740	700	650	550	400
	1.0	360	330	300	240	170
	5.0	52	44	32	24	16
	10	19.5	13.5	10	6.5	3.5
24 hrs/day	0.1	4100	3550	3400	3100	2600
	0.5	780	700	620	540	390
	1.0	365	330	285	230	165
	5.0	50	40	30	22	14
	10	17.5	12.5	10	6.5	3.5
	20	5.5	4	3	2	0.8

"EVEREADY" NO. 430P BATTERY

Type — Leclanché

Suggested Current Range: 0-6 milliamperes



TOP VIEWS OF SOCKET (ASA No. VIII)
SHOWING DIMENSIONS AND TERMINAL MARKINGS

SPECIFICATIONS

Voltage Taps	−, + 30
Terminals	Socket
Average Weight	3.2 oz.
Volume	4.67 cubic inches
Cells	Twenty No. 132 (ASA F30) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 430P

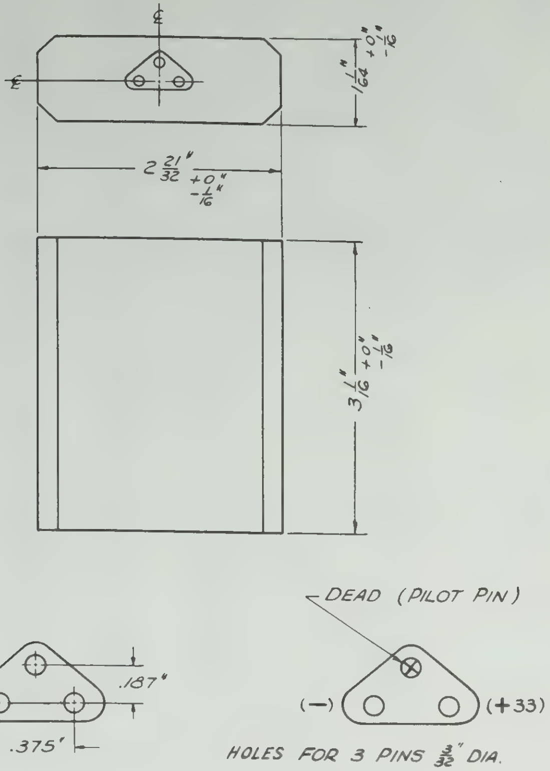
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 16V	18V	20V	22V	24V
2 hrs/day	0.5	720	680	630	560	460
	1.0	380	355	330	300	225
	5.0	60	55	48	39	28
	10	25	21	16.5	13	6.8
	20	7.5	6	4.5	2	0.8
4 hrs/day	0.2	1730	1675	1600	1470	1250
	0.5	760	730	660	590	490
	1.0	370	350	310	270	220
	5.0	59	54	45	35	25
	10	23	19	15	10	3.5
12 hrs/day	0.2	1900	1820	1700	1500	1175
	0.5	740	700	650	550	400
	1.0	360	330	300	240	170
	5.0	52	44	32	24	16
	10	19.5	13.5	10	6.5	3.5
24 hrs/day	0.1	4100	3550	3400	3100	2600
	0.5	780	700	620	540	390
	1.0	365	330	285	230	165
	5.0	50	40	30	22	14
	10	17.5	12.5	10	6.5	3.5
	20	5.5	4	3	2	0.8

"EVEREADY" NO. 433P BATTERY

Type — Leclanché

Suggested Current Range: 0-10 milliamperes



TOP VIEWS OF SOCKET (ASA No. VIII)

SHOWING DIMENSIONS AND TERMINAL MARKINGS

SPECIFICATIONS

Voltage Taps	−, + 33
Terminals	Socket
Average Weight	6 oz.
Volume	8.2 cubic inches
Cells	Twenty-two No. 135 (ASA F40) in series

For service information see reverse side of this sheet

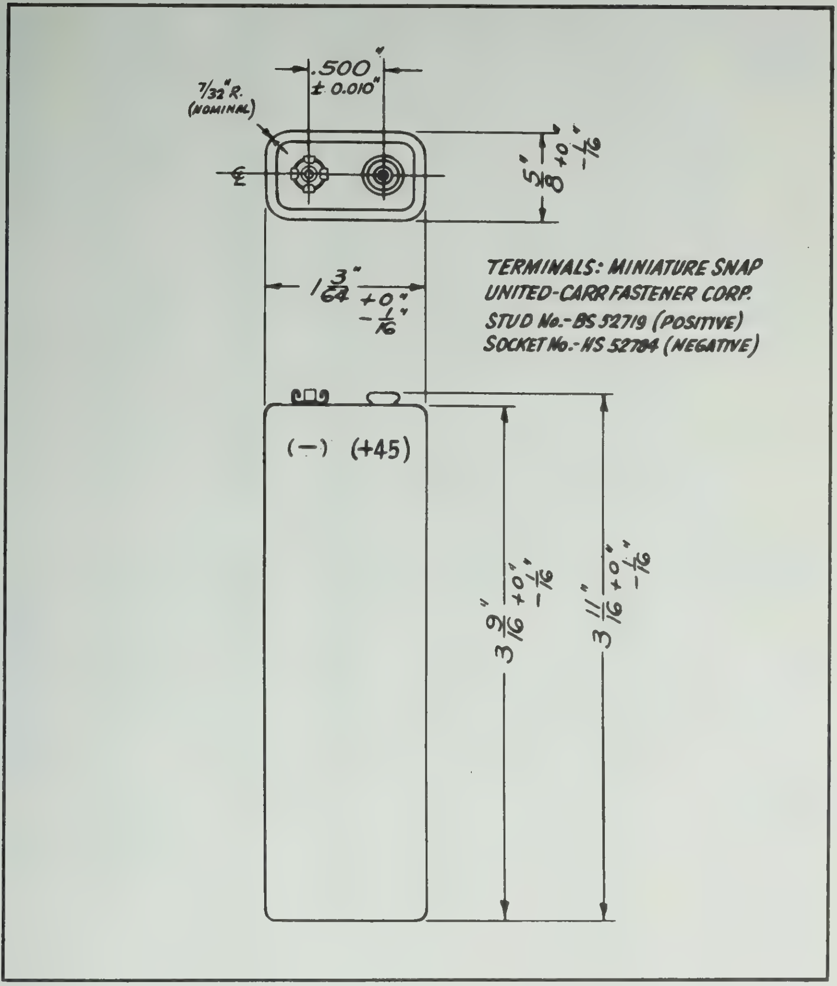
"EVEREADY" NO. 433P

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		17.6V	19.8V	22.0V	24.2V	26.4V
2 hrs/day	0.5	920	890	850	810	730
	1	630	590	550	480	410
	5	150	140	130	98	70
	10	63	56	47	35	21
	20	20	18	15	11	5.4
	30	9.6	8.6	7.5	4.4	1.5
	35	7	6.2	5.4	2.7	0.8
12 hrs/day	0.5	1700	1600	1500	1250	930
	1	790	700	630	580	400
	5	110	92	85	68	45
	10	42	35	30	23	15
	20	16	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8
24 hrs/day	0.5	1700	1620	1550	1300	1000
	1	820	740	650	530	390
	5	105	90	75	55	36
	10	40	33	27	19	10.5
	20	14	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8

"EVEREADY" NO. 415 BATTERY

Type — Leclanché
NEDA Number — 213
Suggested Current Range: 0-4 milliamperes


.500"
± 0.010"
7/32" R.
(NOMINAL)
℄
5/8" +0" −1/16"
1 3/64" +0" −1/16"
TERMINALS: MINIATURE SNAP
UNITED-CARR FASTENER CORP.
STUD No.-BS 52719 (POSITIVE)
SOCKET No.-HS 52784 (NEGATIVE)
(−)
(+45)
3 9/16" +0" −1/16"
3 11/16" +0" −1/16"

SPECIFICATIONS

Voltage Taps	—, + 45
Terminals	Miniature Snap
Average Weight	2.5 oz.
Volume	2.35 cubic inches
Cells	Thirty No. 112 (ASA F20) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 415

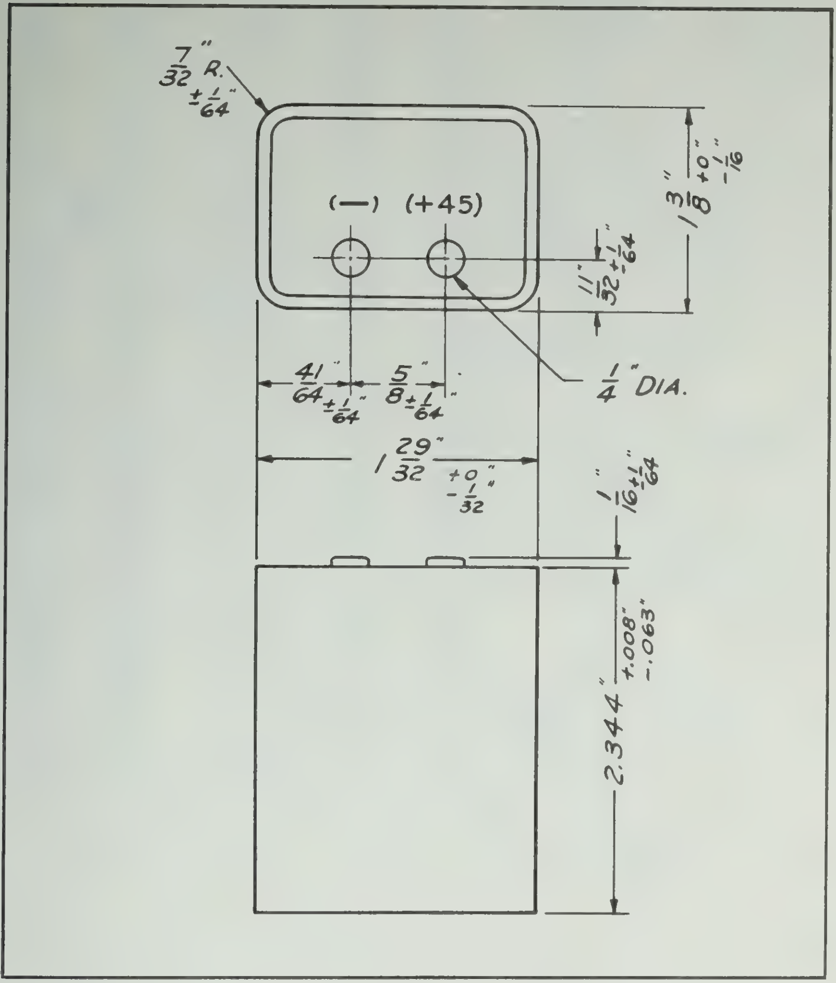
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		24V	27V	30V	33V	36V
2 hrs/day	0.1	1300	1265	1210	1130	1100
	0.2	770	730	700	660	610
	0.3	530	515	490	460	420
	0.5	320	310	295	275	250
	1.0	150	144	138	130	115
	2.0	74	68	64	59	50
	5.0	24	21	18	15	5
4 hrs/day	0.1	1650	1550	1500	1400	1330
	0.2	860	810	780	768	715
	0.3	570	530	510	490	460
	0.5	330	310	300	280	260
	1.0	155	148	140	130	115
	2.0	68	65	60	54	44
	5.0	22	18	14	10	4
12 hrs/day	0.1	1710	1615	1525	1430	1345
	0.2	810	780	740	705	645
	0.3	540	510	480	450	410
	0.5	320	295	275	255	220
	1.0	140	130	117	105	88
	2.0	62	53	45	40	32
	5.0	20	16	10	9	4
24 hrs/day	0.6	310	290	270	240	200
	1.0	135	120	110	100	67
	2.0	57	50	44	38	20
	5.0	16	13	10	9	4

"EVEREADY" NO. 460 BATTERY

Type — Leclanché

Suggested Current Range: 0-6 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 45
Terminals	Flat Contacts
Average Weight	5.3 oz.
Volume	6.14 cubic inches
Cells	Thirty No. 132 (ASA F30) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 460

Estimated Hours Service at 70°F

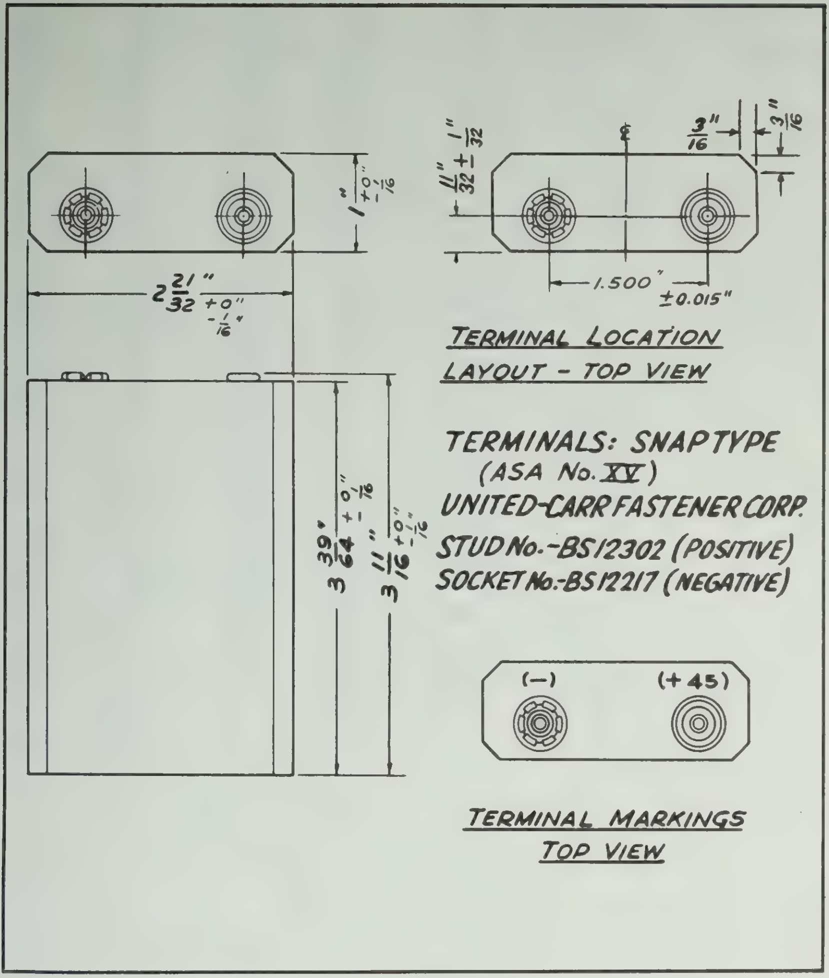
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 24V	27V	30V	33V	36V
2 hrs/day	0.5	720	680	630	560	460
	1.0	380	355	330	300	225
	5.0	60	55	48	39	28
	10	25	21	16.5	13	6.8
	20	7.5	6	4.5	2	0.8
4 hrs/day	0.2	1730	1675	1600	1470	1250
	0.5	760	730	660	590	490
	1.0	370	350	310	270	220
	5.0	59	54	45	35	25
	10	23	19	15	10	3.5
12 hrs/day	0.2	1900	1820	1700	1500	1175
	0.5	740	700	650	550	400
	1.0	360	330	300	240	170
	5.0	52	44	32	24	16
	10	19.5	13.5	10	6.5	3.5
24 hrs/day	0.1	4100	3550	3400	3100	2600
	0.5	780	700	620	540	390
	1.0	365	330	285	230	165
	5.0	50	40	30	22	14
	10	17.5	12.5	10	6.5	3.5
	20	5.5	4	3	2	0.8

45
Volts

"EVEREADY" NO. 455 BATTERY

Type — Leclanché

Suggested current range: 0-10 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 45
Terminals	Snap
Average Weight	7.8 oz.
Volume	9.6 cubic inches
Cells	Thirty No. 135 (ASA F40) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 455

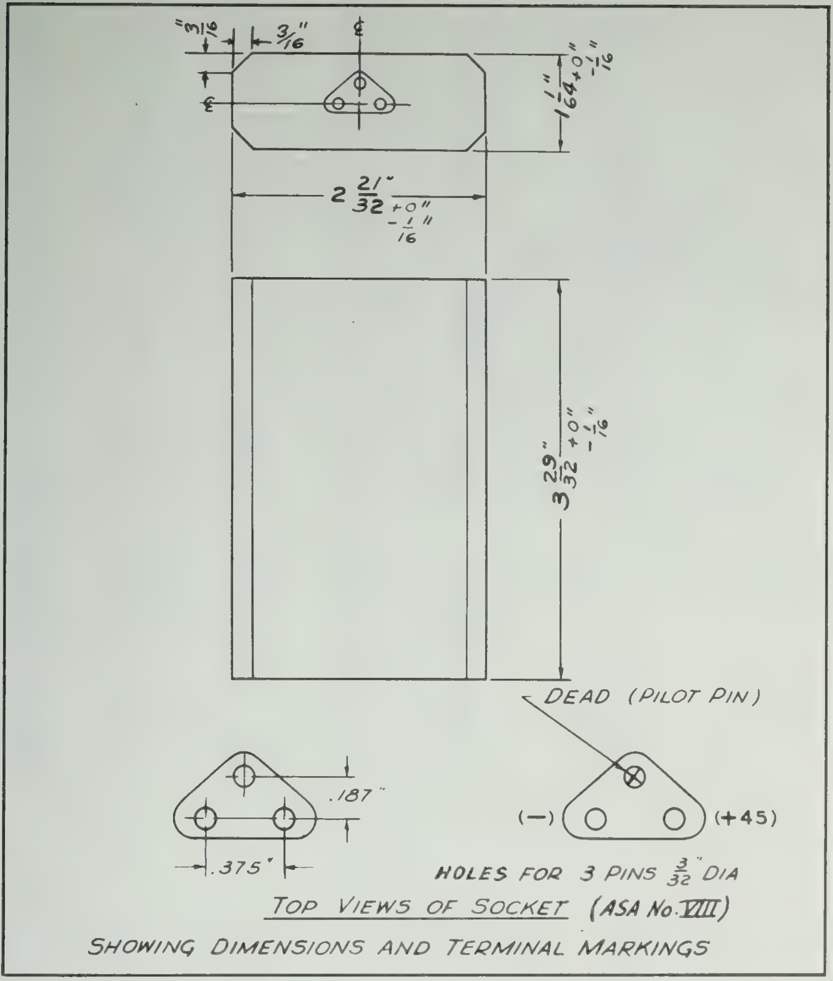
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		24V	27V	30V	33V	36V
2 hrs/day	0.5	920	890	850	810	730
	1	630	590	550	480	410
	5	150	140	130	98	70
	10	63	56	47	35	21
	20	20	18	15	11	5.4
	30	9.6	8.6	7.5	4.4	1.5
	35	7	6.2	5.4	2.7	0.8
12 hrs/day	0.5	1700	1600	1500	1250	930
	1	790	700	630	580	400
	5	110	92	85	68	45
	10	42	35	30	23	15
	20	16	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8
24 hrs/day	0.5	1700	1620	1550	1300	1000
	1	820	740	650	530	390
	5	105	90	75	55	36
	10	40	33	27	19	10.5
	20	14	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8

"EVEREADY" NO. 455P BATTERY

Type — Leclanché

Suggested Current Range: 0-10 milliamperes



TOP VIEWS OF SOCKET (ASA No. VIII)

SHOWING DIMENSIONS AND TERMINAL MARKINGS

SPECIFICATIONS

Voltage Taps	−, + 45
Terminals	Socket
Average Weight	8.6 oz.
Volume	10.4 cubic inches
Cells	Thirty No. 135 (ASA F40) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 455P

Estimated Hours Service at 70°F

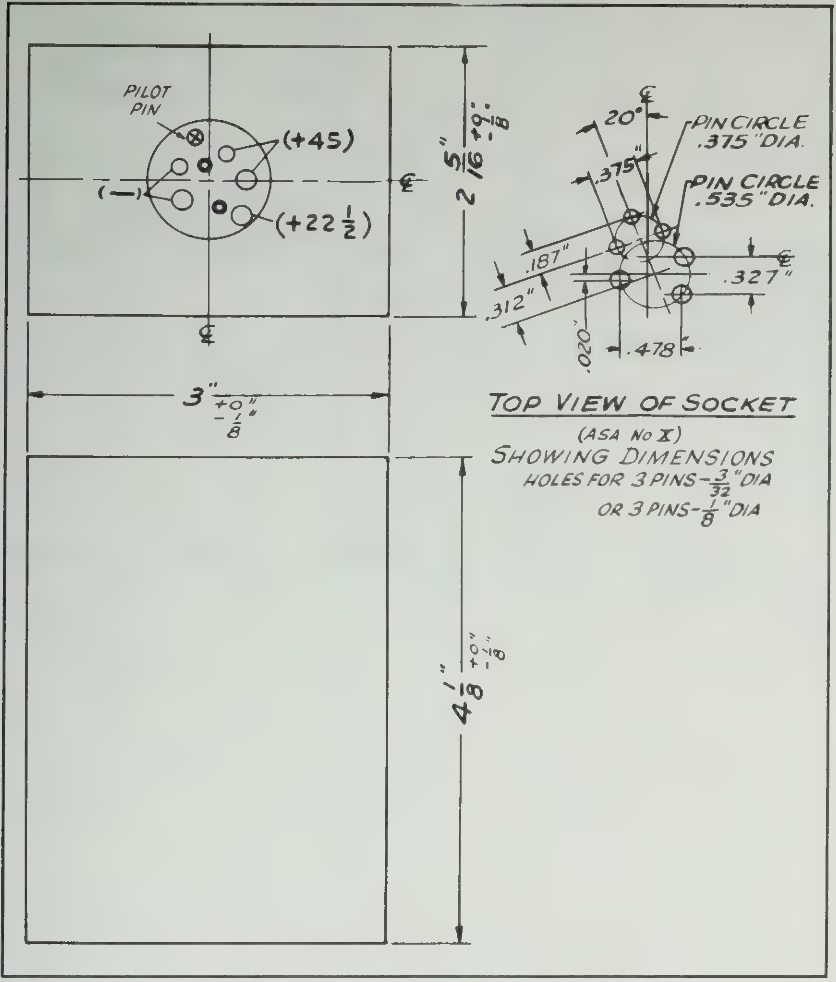
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		24V	27V	30V	33V	36V
2 hrs/day	0.5	920	890	850	810	730
	1	630	590	550	480	410
	5	150	140	130	98	70
	10	63	56	47	35	21
	20	20	18	15	11	5.4
	30	9.6	8.6	7.5	4.4	1.5
	35	7	6.2	5.4	2.7	0.8
12 hrs/day	0.5	1700	1600	1500	1250	930
	1	790	700	630	580	400
	5	110	92	85	68	45
	10	42	35	30	23	15
	20	16	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8
24 hrs/day	0.5	1700	1620	1550	1300	1000
	1	820	740	650	530	390
	5	105	90	75	55	36
	10	40	33	27	19	10.5
	20	14	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8

"EVEREADY" NO. 738 BATTERY

Type — Leclanché

NEDA Number — 205

Suggested Current Range: 0-25 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 22.5, + 45
Terminals	Socket
Average Weight	1 lb. 3 oz.
Volume	28.6 cubic inches
Cells	Thirty No. 15 (ASA "AA") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 738

Estimated Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE
			30V
4 hrs./day	4.5	10,000	256 hours
	9.0	5000	120 hours
	18	2500	45 hours
24 hrs./day	4.5	10,000	225 hours

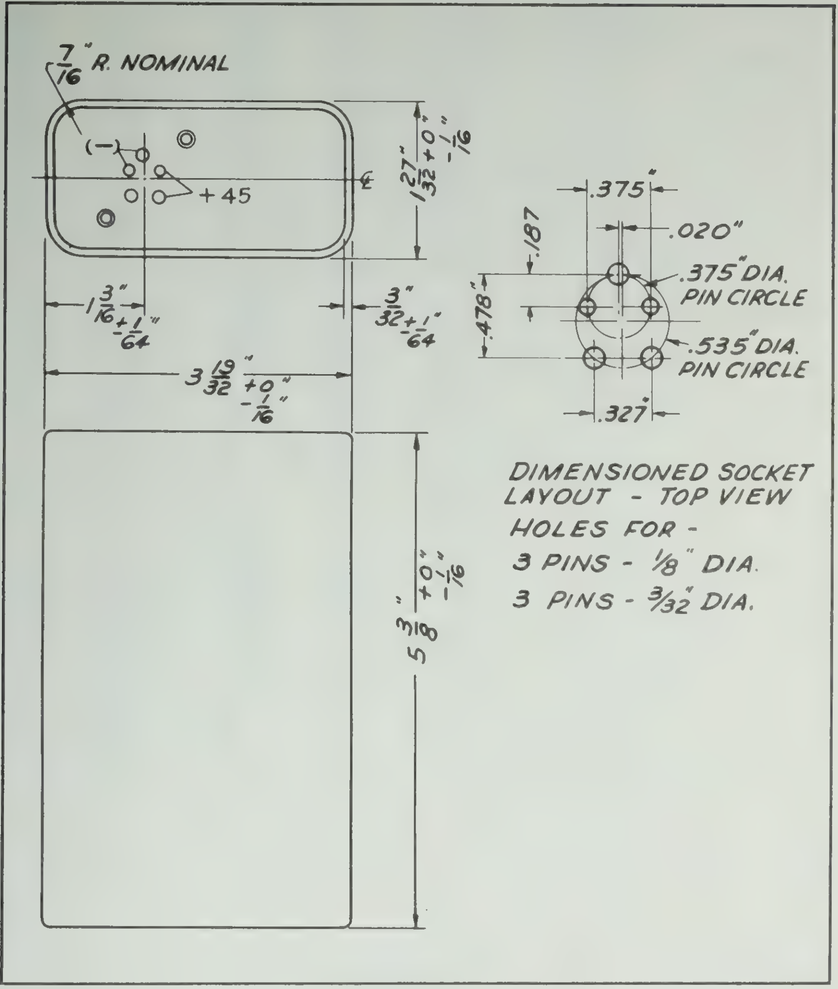
SCHEDULE	LOAD (ohms)	CUT-OFF AMPERAGE		
		2 Amps	2.5 Amps	3 Amps
Discharge 1 second Rest 4 seconds Discharge 1 second Rest 4 seconds Discharge 1 second. Repeat 3 cycles per day at intervals of 3, 3 and 18 hrs, 5 days per week (Cable Breakdown Test)	2	50 days	40 days	30 days

"EVEREADY" NO. 482 BATTERY

Type — Leclanché

NEDA Number — 202

Suggested Current Range: 0-40 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 45
Terminals	Socket
Average Weight	2 lbs. 3 oz.
Volume	36.4 cubic inches
Cells	Thirty No. 165 (ASA F90) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 482

Estimated Hours Service at 70°F

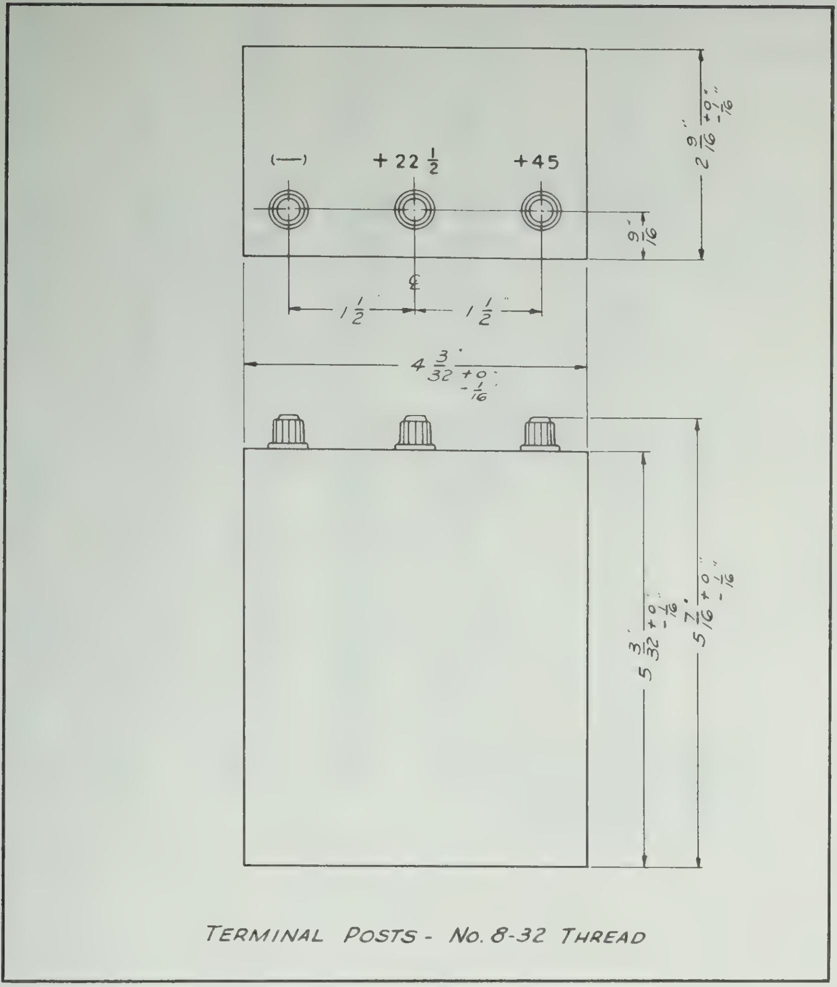
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		24V	27V	30V	33V	36V
4 hrs./day	0.5	2400	2200	1950	1700	1400
	1.0	1650	1500	1300	1140	920
	5.0	520	470	395	320	240
	10	295	265	220	170	125
	20	138	120	96	70	45
	40	50	43	32	21.5	9.5
	80	14.5	11.5	8	3.3	1.3
8 hrs./day	0.5	3400	3200	2850	2600	2150
	1.0	2150	1975	1800	1650	1320
	5.0	570	530	475	350	250
	10	285	255	220	150	98
	20	118	102	84	52	30
	40	42	34	27	15	5.7
	80	12.5	10	7	3.3	1.3
24 hrs./day	0.5	6000	5600	5200	4800	4200
	1.0	3350	3100	2900	2575	2100
	5.0	640	590	500	375	230
	10	275	250	205	138	78
	20	105	92	74	44	23
	40	37	30	23	12.3	5.7
	80	11.5	9	7	3.3	1.3

"EVEREADY" NO. 762S BATTERY

Type — Leclanché

NEDA Number — 709

Suggested Current Range: 0-70 milliamperes



TERMINAL POSTS - No. 8-32 THREAD

SPECIFICATIONS

Voltage Taps	—, + 22.5, + 45
Terminals	Plastic Knurls
Average Weight	2 lbs. 12 oz.
Volume	53.2 cubic inches
Cells	Thirty No. 172 in series

For service information see reverse side of this sheet

"EVEREADY" NO. 762S

Estimated Hours Service at 70°F

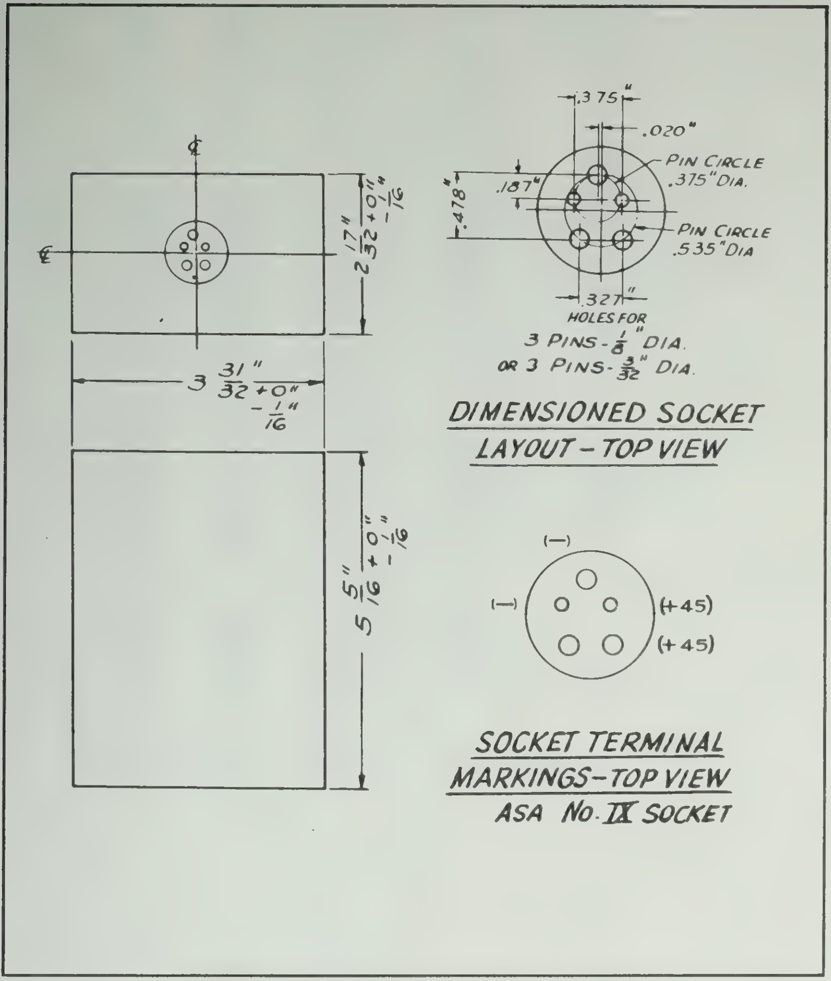
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 24V	27V	30V	33V	36V
2 hrs./day	10	485	430	350	295	240
	20	270	230	185	155	120
	40	125	108	85	68	45
	80	50	40	32	22	10
4 hrs./day	3	1925	1800	1650	1325	1050
	5	1350	1220	1080	840	590
	10	580	520	450	340	255
	20	270	240	200	150	105
	40	120	100	80	60	26
	80	40	35	25	20	8
8 hrs./day	3	1700	1600	1470	1260	940
	5	1080	1000	900	750	540
	10	520	470	410	340	230
	20	220	195	170	135	85
	40	88	75	65	50	27
24 hrs./day	3	2075	1950	1800	1600	1150
	5	1175	1050	980	840	580
	10	490	430	380	300	210
	20	195	165	140	104	72
	40	75	60	48	33	24
	80	25	20	15	10	6

"EVEREADY" NO. 484 BATTERY

Type — Leclanché

NEDA Number — 207

Suggested Current Range: 0-70 milliamperes



DIMENSIONED SOCKET LAYOUT – TOP VIEW

SOCKET TERMINAL MARKINGS–TOP VIEW
ASA No. IX SOCKET

SPECIFICATIONS

Voltage Taps .... —, + 45
Terminals .... Socket
Average Weight .... 3 lbs. 2 oz.
Volume .... 53.4 cubic inches
Cells .... Thirty No. 172 in series

For service information see reverse side of this sheet

"EVEREADY" NO. 484

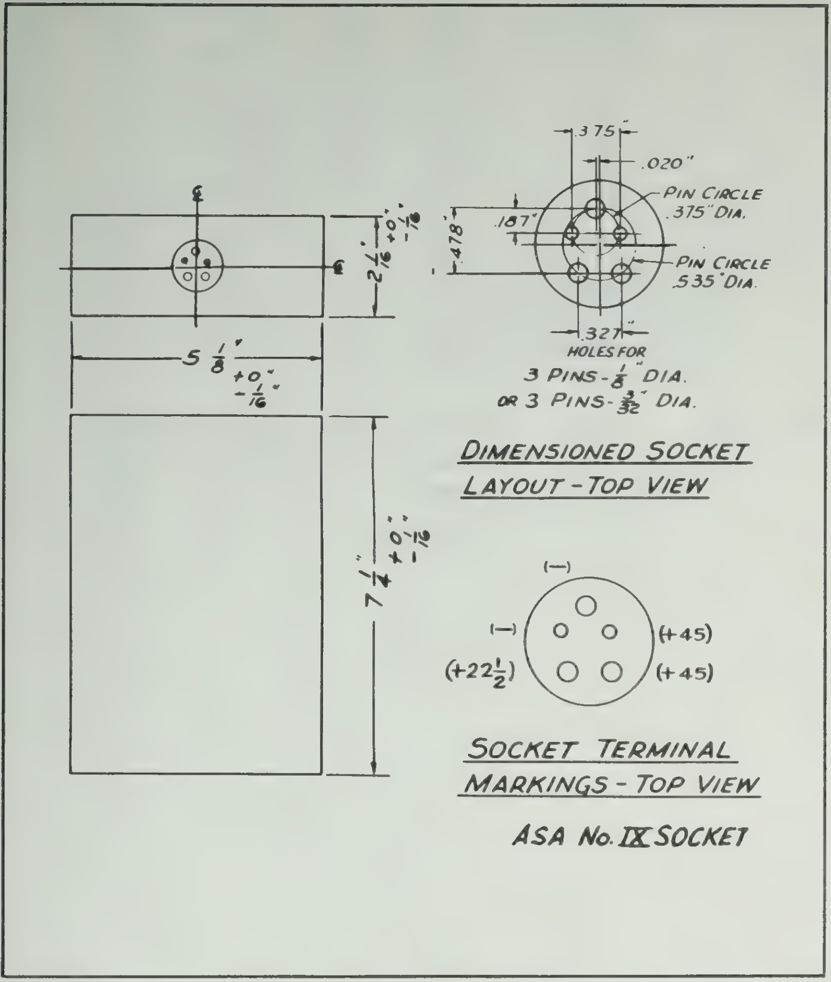
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		24V	27V	30V	33V	36V
2 hrs./day	10	485	430	350	295	240
	20	270	230	185	155	120
	40	125	108	85	68	45
	80	50	40	32	22	10
4 hrs./day	3	1925	1800	1650	1325	1050
	5	1350	1220	1080	840	590
	10	580	520	450	340	255
	20	270	240	200	150	105
	40	120	100	80	60	26
	80	40	35	25	20	8
8 hrs./day	3	1700	1600	1470	1260	940
	5	1080	1000	900	750	540
	10	520	470	410	340	230
	20	220	195	170	135	85
	40	88	75	65	50	27
24 hrs./day	3	2075	1950	1800	1600	1150
	5	1175	1050	980	840	580
	10	490	430	380	300	210
	20	195	165	140	104	72
	40	75	60	48	33	24
	80	25	20	15	10	6

"EVEREADY" NO. 487 BATTERY

Type — Leclanché

Suggested Current Range: 0-80 milliamperes


℄
℄
$2\frac{7}{16}$" +0" −$\frac{1}{16}$"
5 $\frac{1}{8}$" +0" −$\frac{1}{16}$"
$7\frac{1}{4}$" +0" −$\frac{1}{16}$"
.375"
.020"
PIN CIRCLE .375" DIA.
.187"
.478"
PIN CIRCLE .535" DIA.
.327"
HOLES FOR
3 PINS - $\frac{1}{8}$" DIA.
OR 3 PINS - $\frac{3}{32}$" DIA.
DIMENSIONED SOCKET LAYOUT - TOP VIEW
(—)
(—)
(+45)
(+22$\frac{1}{2}$)
(+45)
SOCKET TERMINAL MARKINGS - TOP VIEW
ASA No. IX SOCKET

SPECIFICATIONS

Voltage Taps	—, + 22.5, + 45
Terminals	Socket
Average Weight	4 lbs. 2 oz.
Volume	76.7 cubic inches
Cells	Thirty No. 175 (ASA F100) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 487

Estimated Hours Service at 70°F

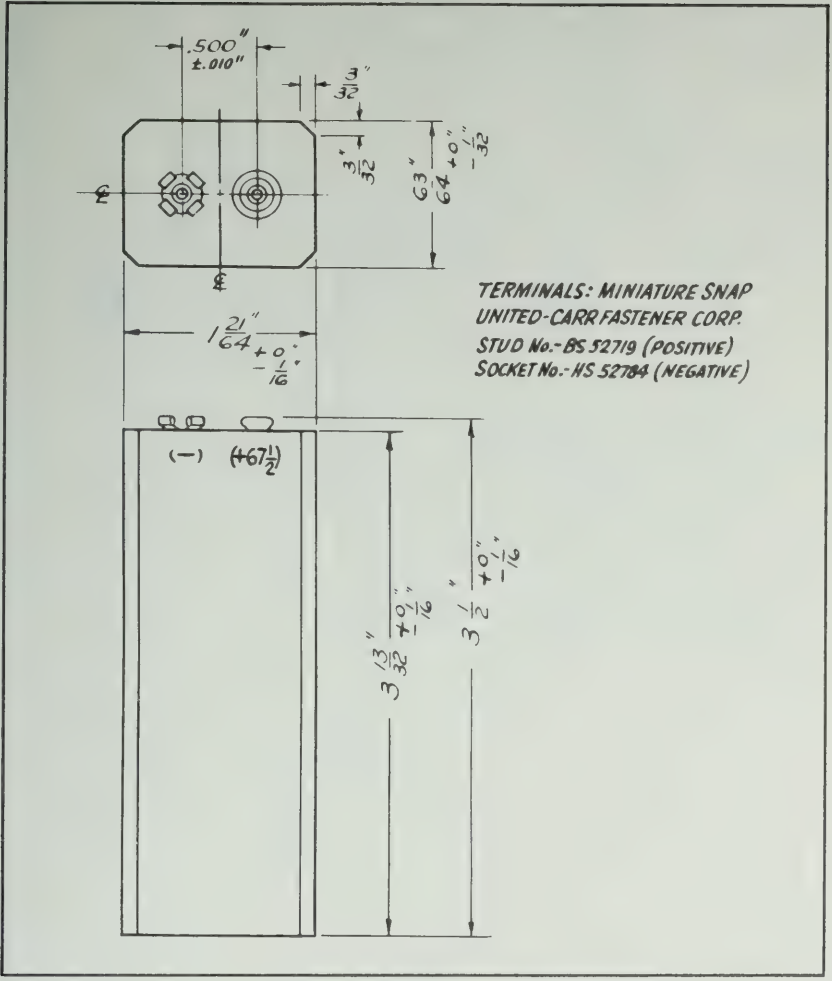
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 24V	27V	30V	33V	36V
2 hrs./day	5	920	860	800	715	600
	10	540	480	440	380	300
	20	300	275	245	200	140
	30	200	170	150	130	85
	50	110	95	80	60	38
4 hrs./day	5	1600		1250	900	
	10	750		580	410	
	20	350		230	170	
	30	200		135	100	
	50	110		72	56	
24 hrs./day	5	1600		1350	1000	
	10	700		540	380	
	20	280		210	140	
	30	170		125	80	
	50	90		65	40	

"EVEREADY" NO. 416 BATTERY

Type — Leclanché

NEDA Number — 217

Suggested Current Range: 0-3 milliamperes


.500"
±.010"
3/32"
3/32"
63/64" +0" −1/32"
℄
℄
1 21/64" +0" −1/16"
TERMINALS: MINIATURE SNAP
UNITED-CARR FASTENER CORP.
STUD No.-BS 52719 (POSITIVE)
SOCKET No.-HS 52784 (NEGATIVE)
(−)
(+67½)
3 13/32" +0" −1/16"
3 ½" +0" −1/16"

SPECIFICATIONS

Voltage Taps	—, + 67.5
Terminals	Miniature Snap
Average Weight	4 oz.
Volume	4.45 cubic inches
Cells	Forty-six No. 114 in series

For service information see reverse side of this sheet

"EVEREADY" NO. 416

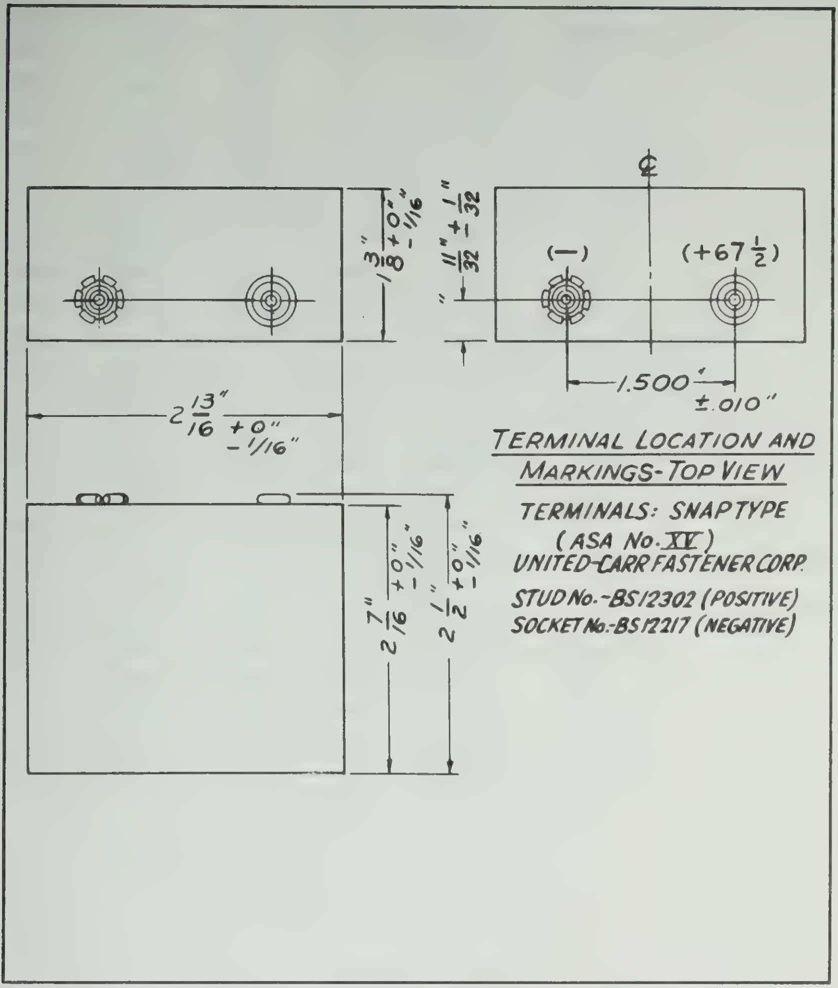
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE		
			36V	45V	51V
2 hrs./day	3.45	20,000	62	53	45

"EVEREADY" NO. 457 BATTERY

Type — Leclanché

Suggested Current Range: 0-6 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 67.5
Terminals	Snap
Average Weight	7.4 oz.
Volume	9.46 cubic inches
Cells	Forty-five No. 132 (ASA F30) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 457

Estimated Hours Service at 70°F

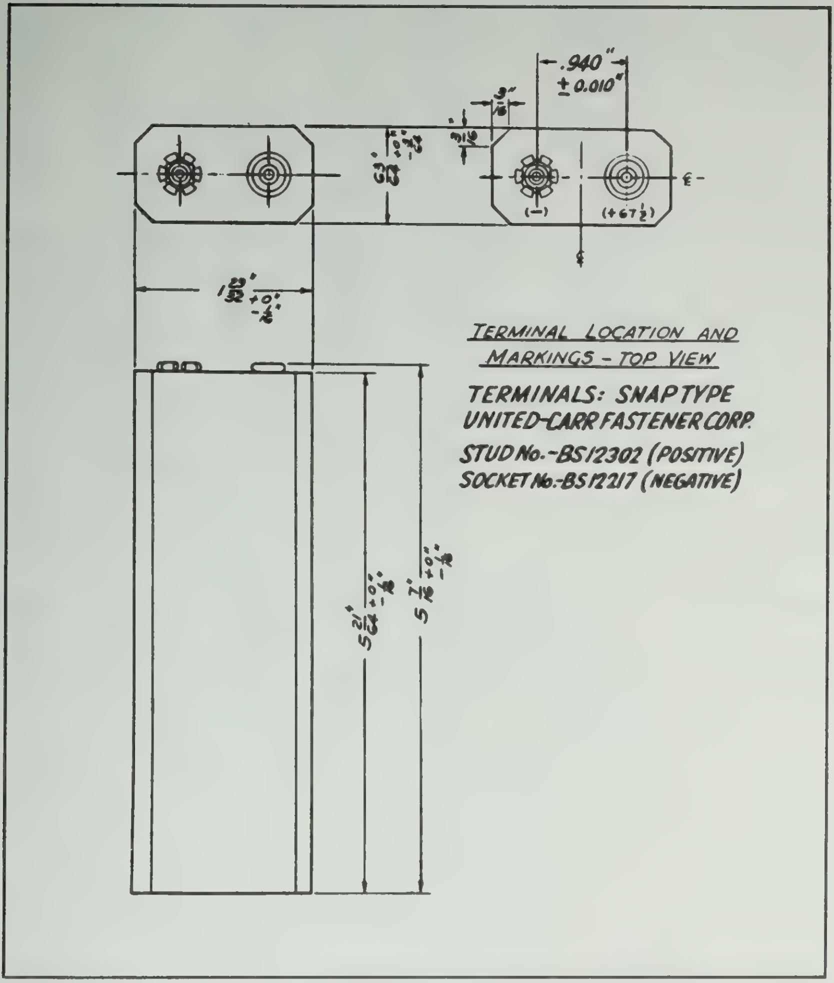
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		36.0V	40.5V	45.0V	49.5V	54.0V
2 hrs./day	0.5	720	680	630	560	460
	1.0	380	355	330	300	225
	5.0	60	55	48	39	28
	10	25	21	16.5	13	6.8
	20	7.5	6	4.5	2	0.8
4 hrs./day	0.2	1730	1675	1600	1470	1250
	0.5	760	730	660	590	490
	1.0	370	350	310	270	220
	5.0	59	54	45	35	25
	10	23	19	15	10	3.5
12 hrs./day	0.2	1900	1820	1700	1500	1175
	0.5	740	700	650	550	400
	1.0	360	330	300	240	170
	5.0	52	44	32	24	16
	10	19.5	13.5	10	6.5	3.5
24 hrs./day	0.1	4100	3550	3400	3100	2600
	0.5	780	700	620	540	390
	1.0	365	330	285	230	165
	5.0	50	40	30	22	14
	10	17.5	12.5	10	6.5	3.5
	20	5.5	4	3	2	0.8

"EVEREADY" NO. 477 BATTERY

Type — Leclanché

NEDA Number — 211P

Suggested Current Range: 0-8 milliamperes



TERMINAL LOCATION AND MARKINGS - TOP VIEW

TERMINALS: SNAP TYPE
UNITED-CARR FASTENER CORP.
STUD No.-BS12302 (POSITIVE)
SOCKET No.-BS12217 (NEGATIVE)

SPECIFICATIONS

Voltage Taps	—, + 67.5
Terminals	Snap
Average Weight	8.6 oz.
Volume	9.96 cubic inches
Cells	Forty-four No. 125 in series

For service information see reverse side of this sheet

"EVEREADY" NO. 477

Estimated Hours Service at 70°F

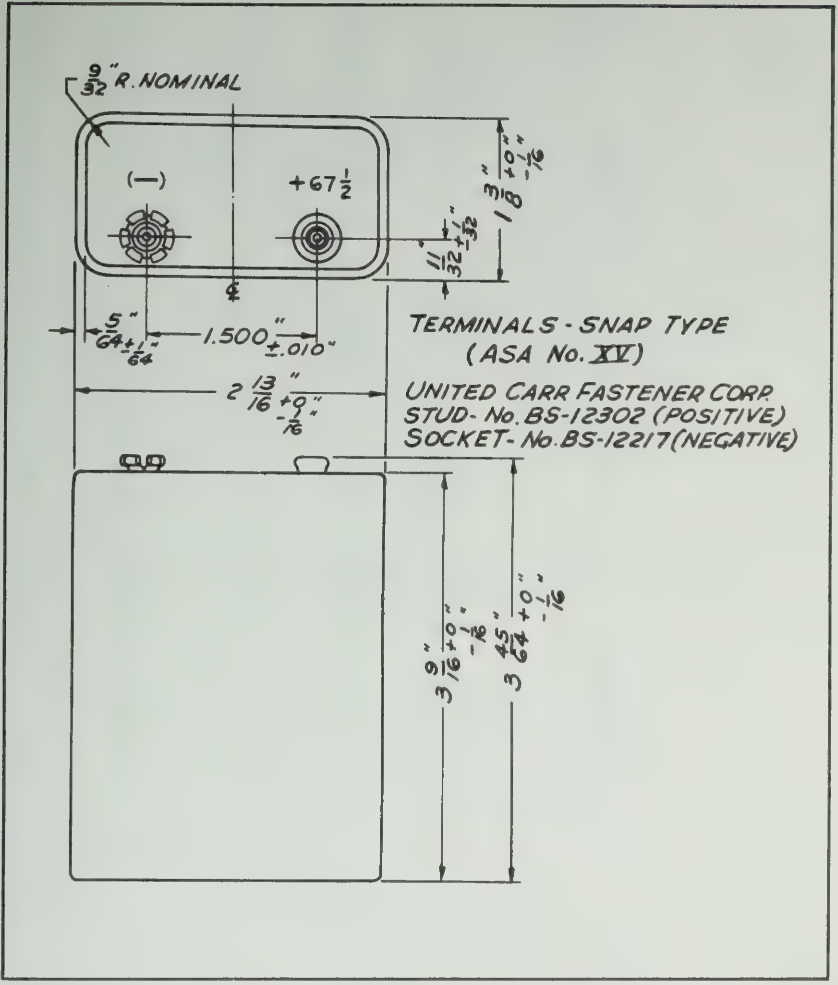
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		35.2V	39.6V	44.0V	48.4V	52.8V
2 hrs./day	0.6	820	805	790	770	680
	1.0	590	565	540	500	450
	2.5	230	224	215	200	180
	5.0	112	106	100	90	75
	10	50	48	43	37	30
4 hrs./day	0.6	860	845	820	800	780
	1.0	560	540	520	490	450
	2.5	225	215	200	180	150
	5.0	105	95	90	75	60
	10	43	40	36	30	22
12 hrs./day	0.6	980	930	870	820	740
	1.0	600	560	520	485	430
	2.5	220	200	185	170	140
	5.0	90	75	66	57	42
	10	34	26	21	10	8
24 hrs./day	0.6	1070	1000	940	880	800
	1.0	640	580	540	500	435
	2.5	215	180	165	145	125
	5.0	80	64	50	43	35
	10	27	19	13	10	8

"EVEREADY" NO. 467 BATTERY

Type — Leclanché

NEDA Number — 200

Suggested Current Range: 0-10 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 67.5
Terminals	Snap
Average Weight	13.5 oz.
Volume	14.2 cubic inches
Cells	Forty-five No. 135 (ASA F40) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 467

Estimated Hours Service at 70°F

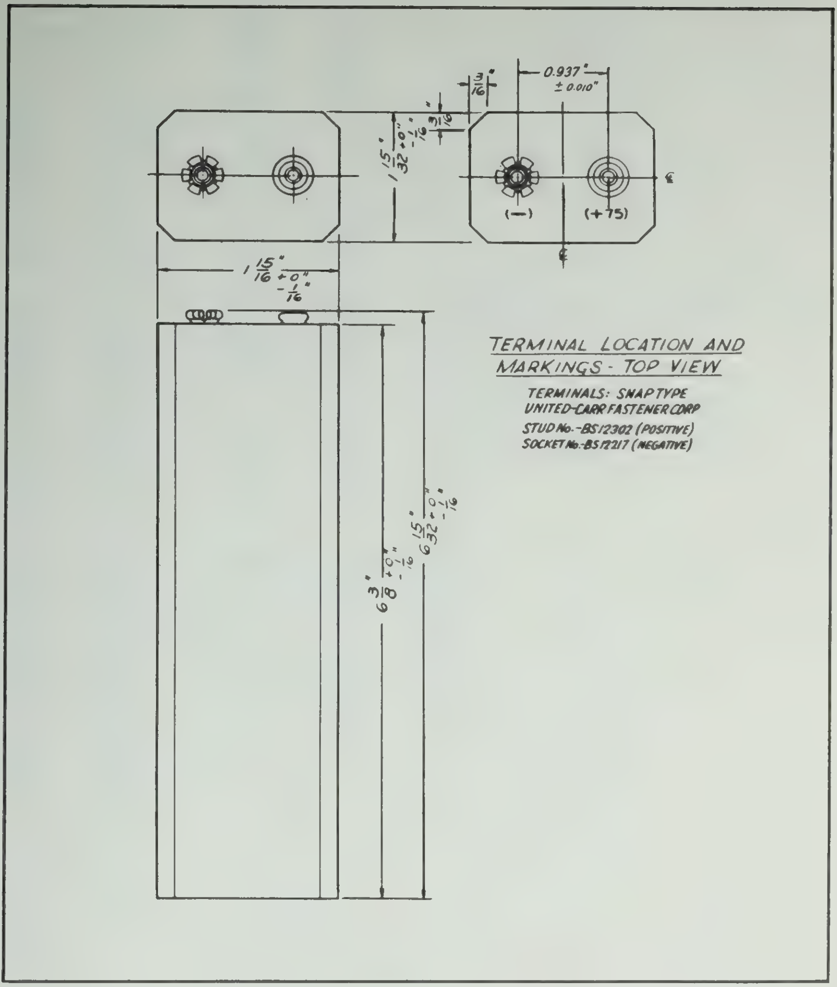
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 36.0V	40.5V	45.0V	49.5V	54.0V
2 hrs./day	0.5	920	890	850	810	730
	1	630	590	550	480	410
	5	150	140	130	98	70
	10	63	56	47	35	21
	20	20	18	15	11	5.4
	30	9.6	8.6	7.5	4.4	1.5
	35	7	6.2	5.4	2.7	0.8
12 hrs./day	0.5	1700	1600	1500	1250	930
	1	790	700	630	580	400
	5	110	92	85	68	45
	10	42	35	30	23	15
	20	16	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8
24 hrs./day	0.5	1700	1620	1550	1300	1000
	1	820	740	650	530	390
	5	105	90	75	55	36
	10	40	33	27	19	10.5
	20	14	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8

"EVEREADY" NO. 437 BATTERY

Type — Leclanché

NEDA Number — 212

Suggested Current Range: 0-10 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 75
Terminals	Snap
Average Weight	14.8 oz.
Volume	18.2 cubic inches
Cells	Fifty-two No. 135 (ASA F40) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 437

Estimated Hours Service at 70°F

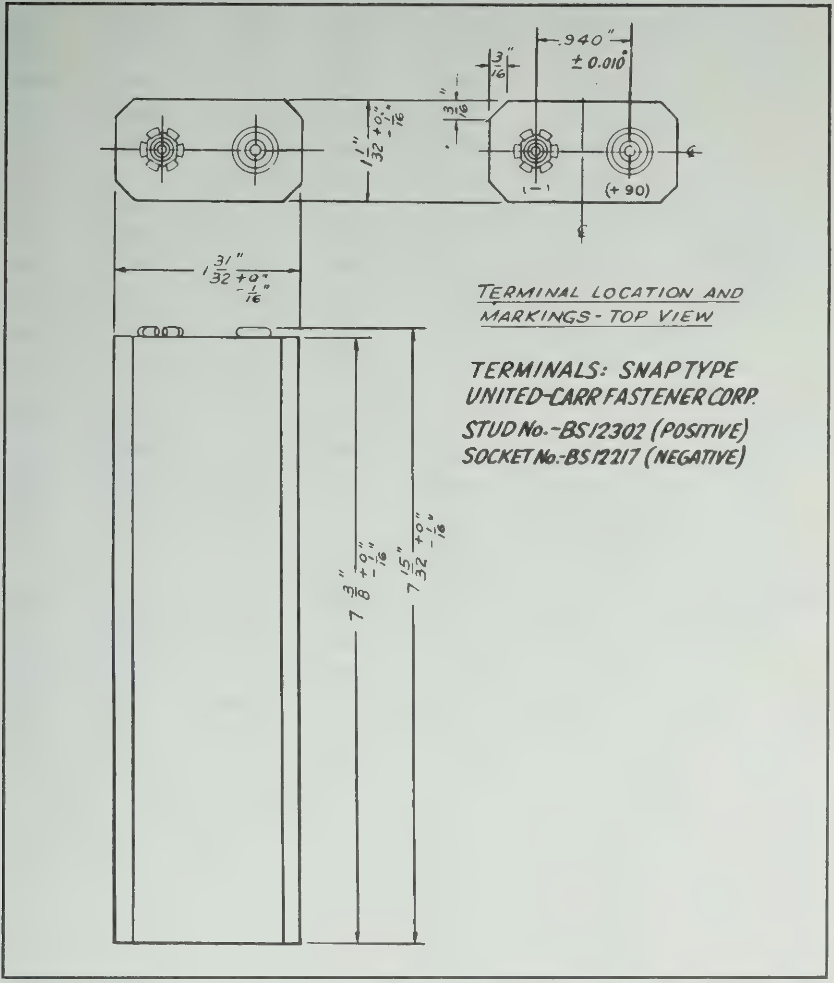
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 41.6V	46.8V	52.0V	57.2V	62.4V
2 hrs./day	0.5	920	890	850	810	730
	1	630	590	550	480	410
	5	150	140	130	98	70
	10	63	56	47	35	21
	20	20	18	15	11	5.4
	30	9.6	8.6	7.5	4.4	1.5
	35	7	6.2	5.4	2.7	0.8
12 hrs./day	0.5	1700	1600	1500	1250	930
	1	790	700	630	580	400
	5	110	92	85	68	45
	10	42	35	30	23	15
	20	16	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8
24 hrs./day	0.5	1700	1620	1550	1300	1000
	1	820	740	650	530	390
	5	105	90	75	55	36
	10	40	33	27	19	10.5
	20	14	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8

"EVEREADY" NO. 479 BATTERY

Type — Leclanché

NEDA Number — 214

Suggested Current Range: 0-8 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 90
Terminals	Snap
Average Weight	12 oz.
Volume	15.0 cubic inches
Cells	Sixty No. 125 in series

For service information see reverse side of this sheet

"EVEREADY" NO. 479

Estimated Hours Service at 70°F

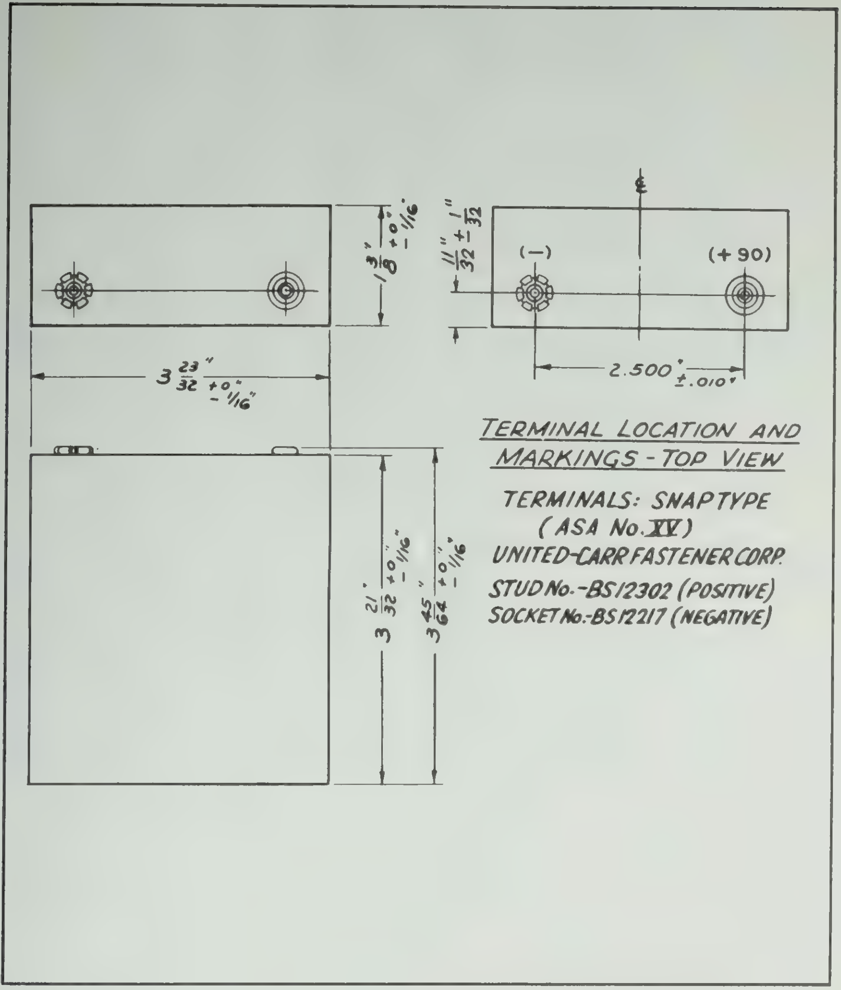
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 48V	54V	60V	66V	72V
2 hrs./day	0.6	820	805	790	770	680
	1.0	590	565	540	500	450
	2.5	230	224	215	200	180
	5.0	112	106	100	90	75
	10	50	48	43	37	30
4 hrs./day	0.6	860	845	820	800	780
	1.0	560	540	520	490	450
	2.5	225	215	200	180	150
	5.0	105	95	90	75	60
	10	43	40	36	30	22
12 hrs./day	0.6	980	930	870	820	740
	1.0	600	560	520	485	430
	2.5	220	200	185	170	140
	5.0	90	75	66	57	42
	10	34	26	21	10	8
24 hrs./day	0.6	1070	1000	940	880	800
	1.0	640	580	540	500	435
	2.5	215	180	165	145	125
	5.0	80	64	50	43	35
	10	27	19	13	10	8

"EVEREADY" NO. 490 BATTERY

Type — Leclanché

NEDA Number — 204

Suggested Current Range: 0-10 milliamperes


1 3/8" +0" −1/16"
11/32" ± 1/32"
℄
(−)
(+90)
3 23/32" +0" −1/16"
2.500" ±.010"
3 21/32" +0" −1/16"
3 45/64" +0" −1/16"
TERMINAL LOCATION AND MARKINGS - TOP VIEW
TERMINALS: SNAPTYPE (ASA No. XV)
UNITED-CARR FASTENER CORP.
STUD No.-BS12302 (POSITIVE)
SOCKET No.-BS12217 (NEGATIVE)

SPECIFICATIONS

Voltage Taps	−, + 90
Terminals	Snap
Average Weight	15 oz.
Volume	18.8 cubic inches
Cells	Sixty No. 135 (ASA F40) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 490

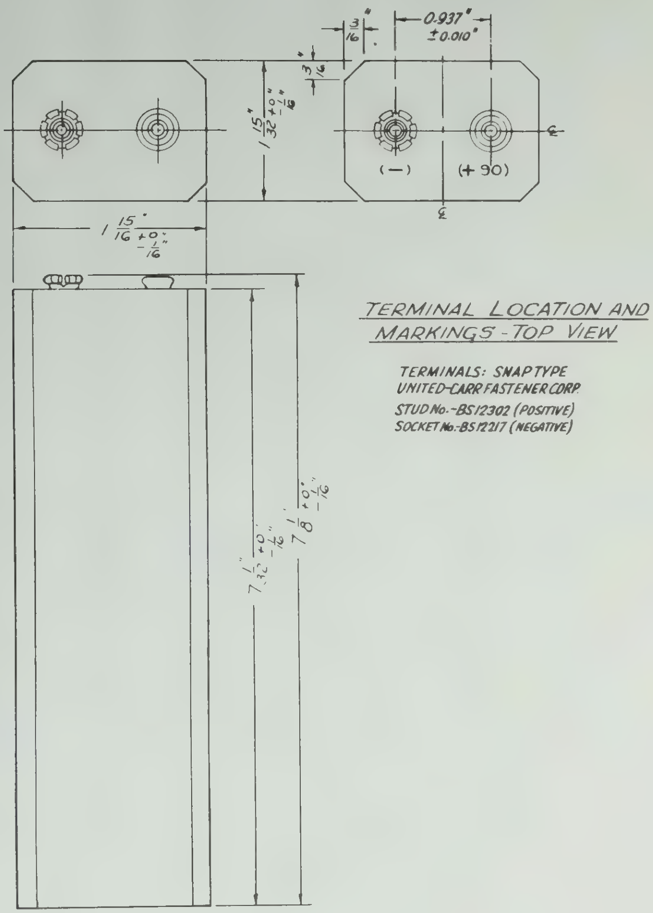
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 48V	54V	60V	66V	72V
2 hrs/day	0.5	920	890	850	810	730
	1	630	590	550	480	410
	5	150	140	130	98	70
	10	63	56	47	35	21
	20	20	18	15	11	5.4
	30	9.6	8.6	7.5	4.4	1.5
	35	7	6.2	5.4	2.7	0.8
12 hrs/day	0.5	1700	1600	1500	1250	930
	1	790	700	630	580	400
	5	110	92	85	68	45
	10	42	35	30	23	15
	20	16	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8
24 hrs/day	0.5	1700	1620	1550	1300	1000
	1	820	740	650	530	390
	5	105	90	75	55	36
	10	40	33	27	19	10.5
	20	14	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8

"EVEREADY" NO. 495 BATTERY

Type — Leclanché

Suggested Current Range: 0-10 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 90
Terminals	Snap
Average Weight	1 lb.
Volume	20.1 cubic inches
Cells	Sixty No. 135 (ASA F40) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 495

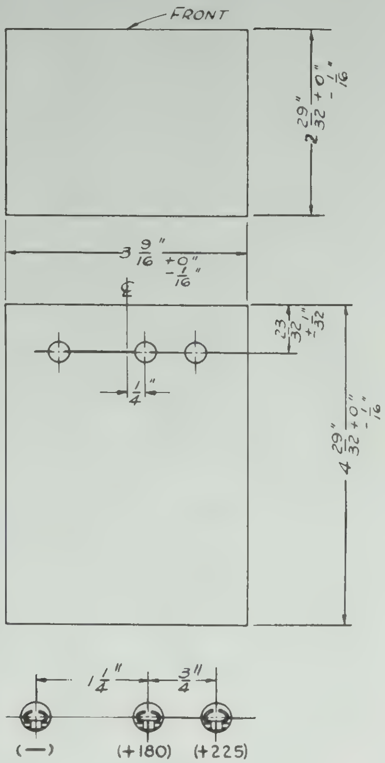
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		48V	54V	60V	66V	72V
2 hrs/day	0.5	920	890	850	810	730
	1	630	590	550	480	410
	5	150	140	130	98	70
	10	63	56	47	35	21
	20	20	18	15	11	5.4
	30	9.6	8.6	7.5	4.4	1.5
	35	7	6.2	5.4	2.7	0.8
12 hrs/day	0.5	1700	1600	1500	1250	930
	1	790	700	630	580	400
	5	110	92	85	68	45
	10	42	35	30	23	15
	20	16	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8
24 hrs/day	0.5	1700	1620	1550	1300	1000
	1	820	740	650	530	390
	5	105	90	75	55	36
	10	40	33	27	19	10.5
	20	14	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8

"EVEREADY" NO. 492 BATTERY

Type — Leclanché

Suggested Current Range: 0-10 milliamperes


FRONT
$2\frac{29}{32}$" +0" −$\frac{1}{16}$"
$3\frac{9}{16}$" +0" −$\frac{1}{16}$"
℄
$\frac{23}{32}$" ±$\frac{1}{32}$
$\frac{1}{4}$"
$4\frac{29}{32}$" +0" −$\frac{1}{16}$"
$1\frac{1}{4}$"
$\frac{3}{4}$"
(−)
(+180)
(+225)

SOCKET TERMINAL LOCATION AND MARKINGS

(−) – HOLE FOR 1/8" PIN
+180 – HOLE FOR 1/8" PIN
+225 – HOLE FOR 5/32" PIN

SPECIFICATIONS

Voltage Taps	−, + 180, + 225
Terminals	Socket
Average Weight	2 lbs. 8 oz.
Volume	50.9 cubic inches
Cells	One hundred fifty No. 135 (ASA F40) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 492

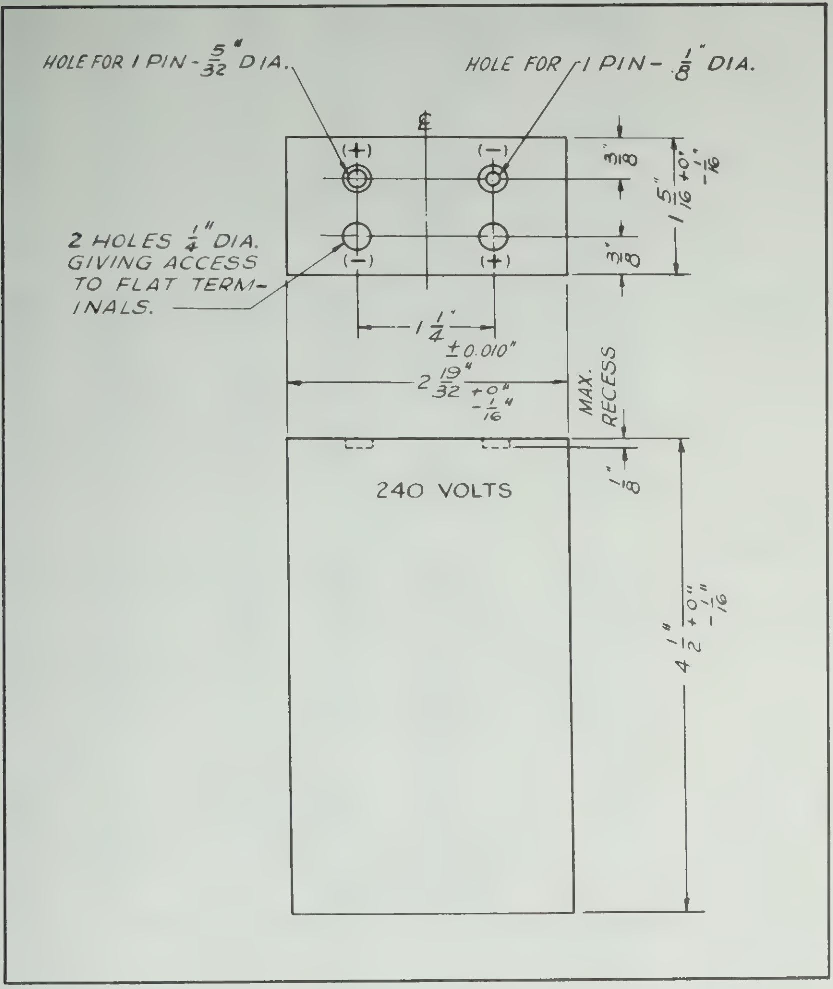
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 120V	135V	150V	165V	180V
2 hrs/day	0.5	920	890	850	810	730
	1	630	590	550	480	410
	5	150	140	130	98	70
	10	63	56	47	35	21
	20	20	18	15	11	5.4
	30	9.6	8.6	7.5	4.4	1.5
	35	7	6.2	5.4	2.7	0.8
12 hrs/day	0.5	1700	1600	1500	1250	930
	1	790	700	630	580	400
	5	110	92	85	68	45
	10	42	35	30	23	15
	20	16	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8
24 hrs/day	0.5	1700	1620	1550	1300	1000
	1	820	740	650	530	390
	5	105	90	75	55	36
	10	40	33	27	19	10.5
	20	14	12	9.6	6.5	4
	30	7.6	6.5	5	3.2	1.5
	35	6	5	3.8	2.4	0.8

"EVEREADY" NO. 491 BATTERY

Type — Leclanché

Suggested Current Range: 0-2.5 milliamperes



SPECIFICATIONS

Voltage Taps	−, + 240
Terminals	Flat Recessed & Socket
Average Weight	13 oz.
Volume	15.0 cubic inches
Cells	One hundred sixty No. 112 (ASA F20) in series

For service information see reverse side of this sheet

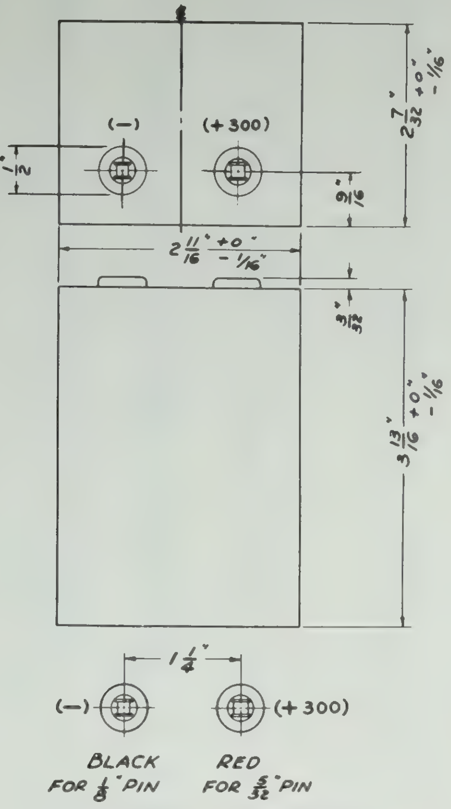
"EVEREADY" NO. 491

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		128V	144V	160V	176V	192V
2 hrs/day	0.1	1300	1265	1210	1130	1100
	0.2	770	730	700	660	610
	0.3	530	515	490	460	420
	0.5	320	310	295	275	250
	1.0	150	144	138	130	115
	2.0	74	68	64	59	50
	5.0	24	21	18	15	5
4 hrs/day	0.1	1650	1550	1500	1400	1330
	0.2	860	810	780	768	715
	0.3	570	530	510	490	460
	0.5	330	310	300	280	260
	1.0	155	148	140	130	115
	2.0	68	65	60	54	44
	5.0	22	18	14	10	4
12 hrs/day	0.1	1710	1615	1525	1430	1345
	0.2	810	780	740	705	645
	0.3	540	510	480	450	410
	0.5	320	295	275	255	220
	1.0	140	130	117	105	88
	2.0	62	53	45	40	32
	5.0	20	16	10	9	4
24 hrs/day	0.6	310	290	270	240	200
	1.0	135	120	110	100	67
	2.0	57	50	44	38	20
	5.0	16	13	10	9	4

"EVEREADY" NO. 493 BATTERY

Type — Leclanché
NEDA Number — 722
Suggested Current Range: 0-2.5 milliamperes



TOP VIEW OF SOCKETS
(ASA No. XVIII)
SHOWING DIMENSIONS AND TERMINAL MARKINGS

SPECIFICATIONS

Voltage Taps	—, + 300
Terminals	Pin Jacks
Average Weight	14.5 oz.
Volume	23.4 cubic inches
Cells	Two hundred No. 112 (ASA F20) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 493

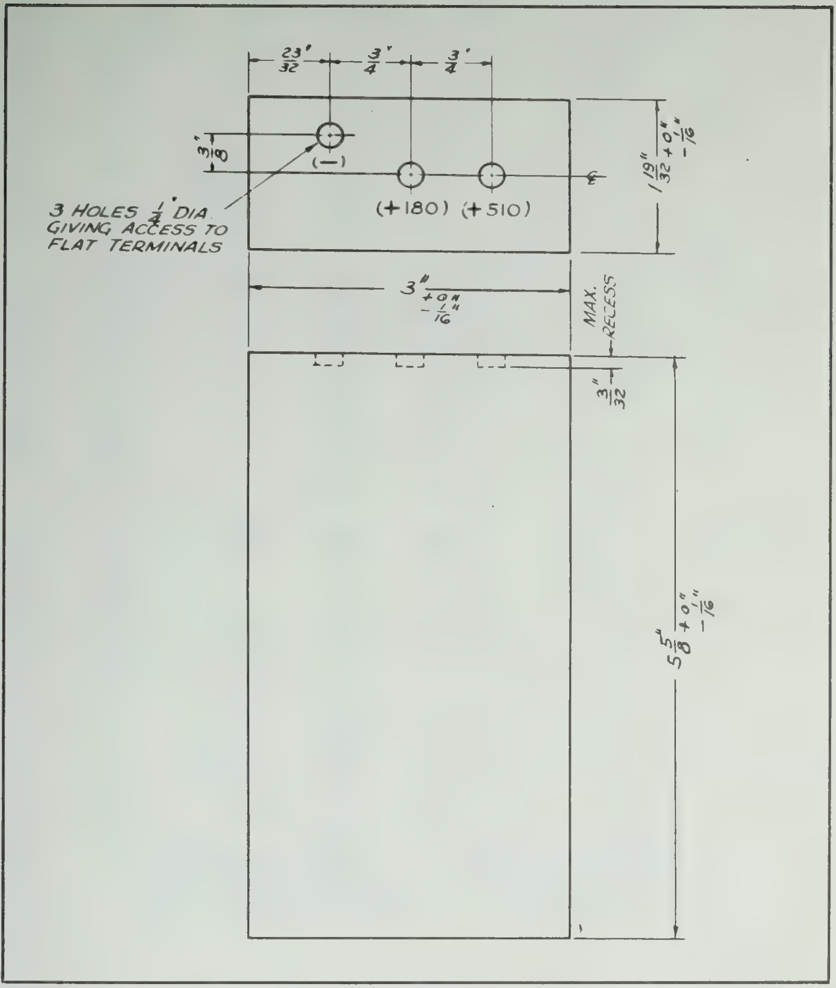
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 160V	180V	200V	220V	240V
2 hrs/day	0.1	1300	1265	1210	1130	1100
	0.2	770	730	700	660	610
	0.3	530	515	490	460	420
	0.5	320	310	295	275	250
	1.0	150	144	138	130	115
	2.0	74	68	64	59	50
	5.0	24	21	18	15	5
4 hrs/day	0.1	1650	1550	1500	1400	1330
	0.2	860	810	780	768	715
	0.3	570	530	510	490	460
	0.5	330	310	300	280	260
	1.0	155	148	140	130	115
	2.0	68	65	60	54	44
	5.0	22	18	14	10	4
12 hrs/day	0.1	1710	1615	1525	1430	1345
	0.2	810	780	740	705	645
	0.3	540	510	480	450	410
	0.5	320	295	275	255	220
	1.0	140	130	117	105	88
	2.0	62	53	45	40	32
	5.0	20	16	10	9	4
24 hrs/day	0.6	310	290	270	240	200
	1.0	135	120	110	100	67
	2.0	57	50	44	38	20
	5.0	16	13	10	9	4

"EVEREADY" NO. 497 BATTERY

Type — Leclanché

Suggested Current Range: 0-2.5 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 180, + 510
Terminals	Flat Recessed
Average Weight	1 lb. 10 oz.
Volume	26.9 cubic inches
Cells	Three hundred thirty-six No. 112 (ASA F20) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 497

Estimated Hours Service at 70°F

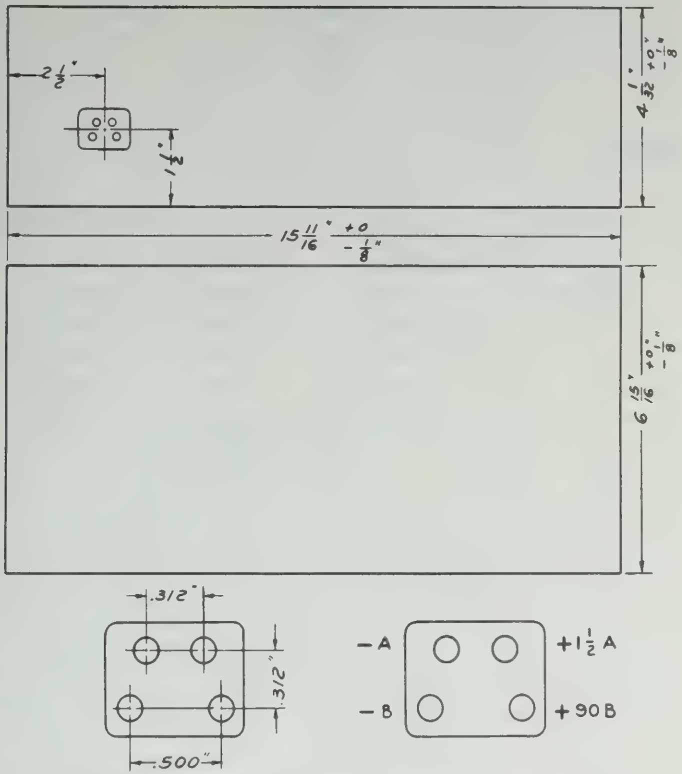
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		269V	302V	336V	370V	403V
2 hrs/day	0.1	1300	1265	1210	1130	1100
	0.2	770	730	700	660	610
	0.3	530	515	490	460	420
	0.5	320	310	295	275	250
	1.0	150	144	138	130	115
	2.0	74	68	64	59	50
	5.0	24	21	18	15	5
4 hrs/day	0.1	1650	1500	1500	1400	1330
	0.2	860	810	780	768	715
	0.3	570	530	510	490	460
	0.5	330	310	300	280	260
	1.0	155	148	140	130	115
	2.0	68	65	60	54	44
	5.0	22	18	14	10	4
12 hrs/day	0.1	1710	1615	1525	1430	1345
	0.2	810	780	740	705	645
	0.3	540	510	480	450	410
	0.5	320	295	275	255	220
	1.0	140	130	117	105	88
	2.0	62	53	45	40	32
	5.0	20	16	10	9	4
24 hrs/day	0.6	310	290	270	240	200
	1.0	135	120	110	100	67
	2.0	57	50	44	38	20
	5.0	16	13	10	9	4

"EVEREADY" NO. 759 BATTERY

Type — Leclanché

Typical Current Drains:

"A" Section—200, 250 and 300 milliamperes
"B" Section—8 to 12 milliamperes


$2\frac{1}{2}$"
$1\frac{3}{4}$"
$4\frac{1}{32}$" +0" −$\frac{1}{8}$"
$15\frac{11}{16}$" +0 −$\frac{1}{8}$"
$6\frac{15}{16}$" +0" −$\frac{1}{8}$"
.312"
.312"
.500"
−A
$+1\frac{1}{2}$ A
−B
+90 B

DIMENSIONED SOCKET LAYOUT - TOP VIEW

HOLES FOR 4 PINS - $\frac{1}{8}$" DIA.

SOCKET TERMINAL VOLTAGES - TOP VIEW

ASA No XIII SOCKET

SPECIFICATIONS

Voltage Taps	−, + 1½, −, + 90
Terminals	Socket
Average Weight	16 lbs. 4 ozs.
Volume	452 cubic inches
Cells: "A" Section	Three No. 6 (ASA 6) in parallel
"B" Section	Sixty No. 175 (ASA F100) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 759

Estimated Hours Service at 70°F

"A" Section

SCHEDULE	STARTING DRAIN (milliamperes)	CUT-OFF VOLTAGE 1.0V	CUT-OFF VOLTAGE 1.1V
4 hrs./day	300	700	600

"B" Section

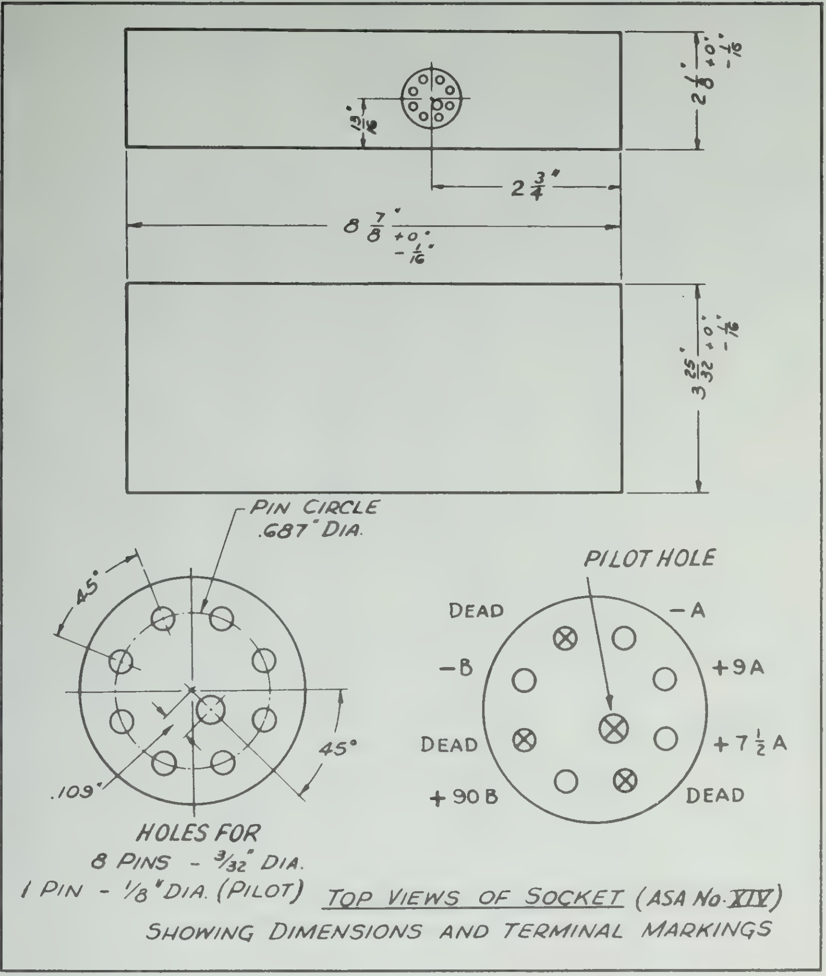
SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE 48V	CUT-OFF VOLTAGE 60V	CUT-OFF VOLTAGE 66V
4 hrs./day	5	1600	1250	900
	10	750	580	410
	20	350	230	170
	30	200	135	100
	50	110	72	56

7.5-9-90
Volts

"EVEREADY" NO. 756 BATTERY

Type — Leclanché

Typical Current Drains: "A" Section — 50 milliamperes
"B" Section — 8 to 12 milliamperes



$2\frac{1}{8}$" +0" −$\frac{1}{16}$"
$\frac{13}{16}$"
$2\frac{3}{4}$"
$8\frac{7}{8}$" +0" −$\frac{1}{16}$"
$3\frac{25}{32}$" +0" −$\frac{1}{16}$"
PIN CIRCLE .687" DIA.
45°
45°
.109"
HOLES FOR
8 PINS - 3/32" DIA.
1 PIN - 1/8" DIA. (PILOT)
PILOT HOLE
DEAD
−A
−B
+9A
DEAD
+7½A
+90B
DEAD

TOP VIEWS OF SOCKET (ASA No. XIV)
SHOWING DIMENSIONS AND TERMINAL MARKINGS

SPECIFICATIONS

Voltage Taps	—, + 7.5, + 9, —, + 90
Terminals	Socket
Average Weight	2 lbs. 14 oz.
Volume	71.1 cubic inches
Cells: "A" Section	Six No. 176 in series
"B" Section	Sixty No. 145 (ASA F60) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 756

Estimated Hours Service at 70°F

"A" Section

SCHEDULE	STARTING DRAIN (milliamperes)	CUT-OFF VOLTAGES		
		5.4V	6.0V	6.6V (9 Volt Tap)
		4.5V	5.0V	5.5V (7.5 Volt Tap)
4 hrs/day	60	95	85	65

"B" Section

SCHEDULE	STARTING DRAINS (milliamperes)	CUT-OFF VOLTAGE				
		48V	54V	60V	66V	72V
2 hrs/day	1	820	780	725	640	550
	3	380	350	320	275	205
	5	240	220	195	165	115
	10	115	100	85	65	42
	20	45	38	30	22	12
	40	15	12	9	6	1.8
4 hrs/day	1	1005	980	925	805	640
	3	410	380	350	310	210
	5	255	220	195	165	110
	10	100	85	72	58	35
	20	34	28	23	17	9
	40	9.5	7.5	6	3.4	1.8
24 hrs/day	1	1420	1260	1100	910	665
	3	350	305	255	215	160
	5	165	145	120	100	75
	10	62	52	42	34	25
	20	22.5	18.5	15	11	6.8
	40	7.8	6.4	5	3.4	1.8

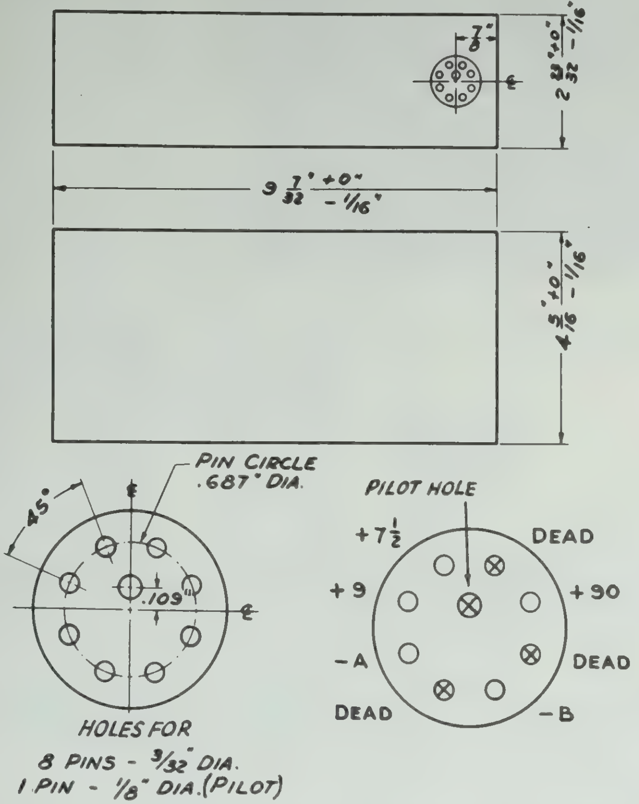
7.5-9-90
Volts

"EVEREADY" NO. 753 BATTERY

Type — LeClanché

NEDA Number — 401

Typical Current Drains: "A" Section — 50 milliamperes
"B" Section — 12 to 15 milliamperes



TOP VIEWS OF SOCKET (ASA No. XIV)
SHOWING DIMENSIONS AND TERMINAL MARKINGS

SPECIFICATIONS

Voltage Taps	—, + 7.5, + 9, —, + 90
Terminals	Socket
Average Weight	4 lbs. 12 oz.
Volume	108 cubic inches
Cells: "A" Section	Six No. 60 (ASA "F") in series
"B" Section	Sixty No. 162 (ASA F70) in series

For service information see reverse side of this sheet

"EVEREADY" NO. 753

Estimated Hours Service at 70°F

"A" Section

SCHEDULE	STARTING DRAINS	CUT-OFF VOLTAGES					
		4.8V	5.4V	6.0V	6.6V	7.2V	(9 Volt Tap)
	(milliamperes)	4.0V	4.5V	5.0V	5.5V	6.0V	(7.5 Volt Tap)
2 hrs/day	5	1650	1550	1450	1400	1300	
	10	900	840	780	720	640	
	20	490	450	410	370	310	
	30	340	310	280	250	200	
	100	98	88	78	68	47	
	200	41	37	33	27	16	
	300	23	20.5	18	13.8	6.8	
4 hrs/day	10	940	880	840	760	680	
	20	475	425	400	335	300	
	30	320	275	260	235	180	
	100	90	75	56	44	36	
	200	35	28	22	16	12	
	300	19	15	12.3	8.5	4	
24 hrs/day	5	2450	2350	2200	2000	1450	
	10	1200	1050	940	880	620	
	20	550	470	390	335	260	
	30	350	275	250	220	155	
	100	84	70	55	40	25	
	200	33	26	20	13	8	
	300	18	14	10.5	6.5	4	

"B" Section

SCHEDULE	STARTING DRAINS	CUT-OFF VOLTAGE				
	(milliamperes)	48V	54V	60V	66V	72V
2 hrs/day	0.5	1460	1400	1325	1200	1050
	1.0	1090	1030	940	850	700
	5.0	415	385	350	290	225
	10	235	215	190	155	110
	20	112	98	84	65	45
	40	43	35	28	21	13
	80	15	11	8	5	3
4 hrs/day	0.5	2575	2425	2250	2025	1800
	1.0	1625	1500	1375	1250	1100
	5.0	455	425	380	330	265
	10	235	210	180	152	115
	20	100	86	69	54	35
	40	34	29	22	14	8.4
	80	10	8.8	6.1	3.5	1.7
24 hrs/day	5.0	430	380	325	265	175
	10	165	145	116	95	60
	20	60	51	40	31	18
	40	23	19	14	9.2	4.6
	80	8.3	6.8	5	2.5	1.1

ALKALINE BATTERIES

The Alkaline-Manganese-Zinc Battery System

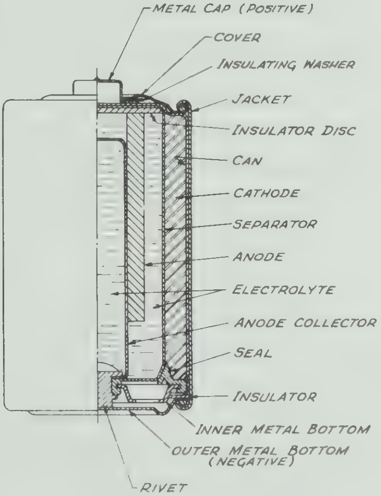
The alkaline-manganese dioxide-zinc battery described on the following pages represents a major advance in portable power sources. This new battery is the result of many years of combined research and development effort.

In answer to a growing need for a high rate source of electrical energy, the Union Carbide Research Laboratories began early in 1955 an intensive study of the caustic manganese system as a high rate source of electrical energy. Alkaline dry cells differing in details of construction from the more familiar Leclanché dry cells had not proven commercially practicable up to this time. The alkaline-manganese system, however, when coupled with a zinc anode of high surface area, shows amazing depolarizing efficiency. On heavy or continuous drains the alkaline cell is most spectacular and shows an excellent advantage over conventional cells on a performance-per-unit-of-cost basis.

"EVEREADY" ALKALINE PRIMARY BATTERIES

This new cell differs from the conventional Leclanché cell primarily in the highly alkaline electrolyte that is used. The cell is a high rate source of electrical energy. Its outstanding advantages are derived from the unique assembly of components and construction methods. *(See Figure below)*

CUTAWAY OF ALKALINE CELL



Two principal features are a manganese dioxide cathode of high density in conjunction with a steel can which serves as a cathode current collector, and a zinc anode of extra high surface area in contact with the electrolyte. These features, coupled with the use of a potassium hydroxide electrolyte of high conductivity give these cells their very low internal resistance and impedance and high service capacity.

The cells are hermetically sealed and encased in steel, providing virtually a leakproof package.

Each cell is a nominal 1.5 volts. The ampere-hour capacity is relatively constant over a range of current drains and discharge schedules.

Heavy current drains and continuous or heavy duty usage impair the efficiency of the conventional carbon-zinc cell to the extent that only a small fraction of the built-in energy may be removed. The primary advantage of the new system lies in its ability to work with a high degree of efficiency under continuous or heavy duty, high drain conditions where the standard round cell is unsatisfactory. Under certain conditions the new alkaline cells will provide more than ten times the service of standard round cells.

Although the alkaline-manganese cells will outperform conventional Leclanché batteries in any type of service, they may not show an economic advantage over standard cells at light drains, or with intermittent duty conditions, or both. For example, at current drains below about 300 milliamperes for the "D" size cell, with intermittent use, alkaline cells, while performing very well, start to lose their economic advantage over conventional carbon-zinc cells.

APPLICATIONS

"Eveready" alkaline primary batteries are ideally suited for use in many types of battery-operated equipment. Some of these applications are listed below. In addition, the characteristics of these batteries make possible the development of equipment which up to this time has been thought impractical because of the lack of a suitable power source.

The "AA" cell ("Eveready" No. E91) is ideal for motion picture camera cranking and radio-controlled model planes and boats. It is an outstanding photoflash cell, combining higher amperage and higher total energy. The "D" cell ("Eveready" No. E95) has proved its worth for electronic flash, model boats and automobiles and innumerable heavy drain applications. Although the "G" size cell with insulated knurl terminals ("Eveready" No. E97S) is about 1/6 the size and 1/4 the weight of the No. 6 cell used in the hobby field, it gives over 70% of the service of the No. 6 cell in glo-plug ignition operation for engines of model airplanes.

ALKALINE CELLS FOR ELECTRONIC FLASH

Many electronic flash units use transistor or vibrator circuits in a converter to change low voltage D.C. into the high voltage necessary to charge the flash capacitor. The current drains involved strain the capabilities even of high amperage photoflash "D" cells. The alkaline "D" cell, No. E95, provides both a sustained short recycling time and 2-3 times as many flashes as photoflash or general purpose cells. This is due to the unusual cell construction which provides a very low internal resistance such that the cell delivers its energy faster than conventional types.

TEMPERATURE CHARACTERISTICS

"Eveready" alkaline-MnO_2 cells exhibit excellent low temperature performance characteristics. They considerably exceed the capabilities of the very best military type Leclanché battery utilizing a special low temperature electrolyte. For example, at –40°F, on a starting drain of 225 milliamperes to a cut-off of 0.93 volt, discharged 80 minutes/day, the alkaline size "D" cell ("Eveready" No. E95) provides on the average over 2½ times the service of the best Leclanché type "D" cell with low temperature electrolyte.

The high temperature characteristics of the alkaline cell are also considerably better than those of the standard carbon-zinc Leclanché cell. Inquiries concerning the feasibility of specific high temperature applications should be referred to the Battery Engineering Department.

SHELF LIFE

The shelf life of "Eveready" alkaline primary cells is superior to that of standard carbon-zinc Lechanché cells. It is improved at both normal and elevated temperatures.

CELL SIZES AVAILABLE IN FUTURE

The "Eveready" No. E96 and No. E97 cells, for which service data are shown, are not presently being offered for general sale, but can be made available for large scale applications. No. E96 is a standard "F" size cell; No. E97 is 11/64″ greater in height than a standard "G" cell.

SOME SUGGESTED APPLICATIONS:

"A" supplies – industrial radio communication
Heating element applications
Bicycle lights and horns
Heavy duty lighting
Transistor pocket radios
Electric shavers
Electronic photoflash
Motion picture camera cranking
Radio controlled model planes and boats
Glo-plug ignition – model planes
Toys
Model boats and automobiles
Any high drain, heavy discharge schedule use

"Eveready" alkaline primary batteries are presently available in seven types. Specifications for these are listed in Table 1.

TABLE 1

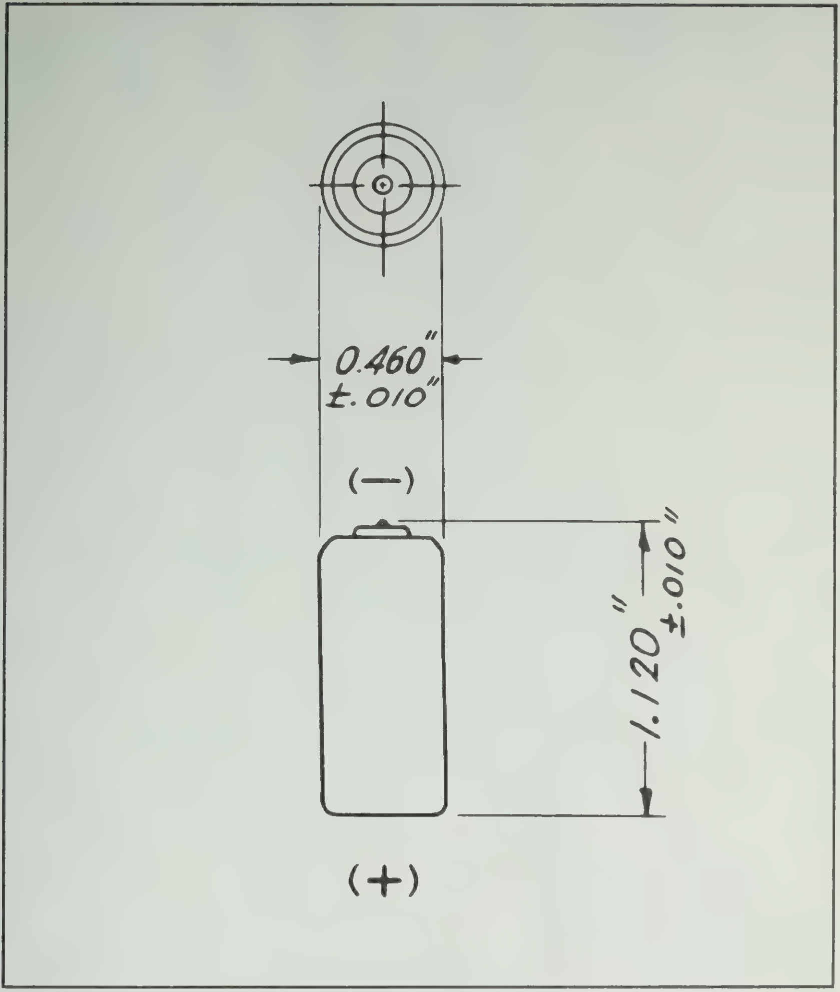
"EVEREADY" ALKALINE PRIMARY BATTERIES

Physical Characteristics

"Eveready" Battery Numbers	Voltage	Number & Size of Cells	Maximum Dimension-Inches				Ter-minals	Weight
			Diam-eter	Length	Width	Height		
E90	1.5	1-"N"	0.470			1.130	Flat	0.35 oz.
E91	1.5	1-"AA"	$\frac{9}{16}$			$1\frac{31}{32}$	Flat	0.75 oz.
E94	1.5	1-½"D"	$1\frac{11}{32}$			$1\frac{13}{64}$	Flat	1.8 oz.
E93	1.5	1-"C"	$1\frac{1}{32}$			$1\frac{15}{16}$	Flat	2.0 oz.
E95	1.5	1-"D"	$1\frac{11}{32}$			$2\frac{13}{32}$	Flat	4.3 oz.
E97S	1.5	1-"G"	$1\frac{11}{32}$			$5\frac{7}{32}$	Plastic Knurls	8.0 oz.
520	6.0	4-"G"		$5\frac{17}{32}$	$4\frac{21}{32}$	$2\frac{21}{32}$	Insulated Screw	2 lbs. 8 oz.

"EVEREADY" NO. E90 CELL

Type—Alkaline
ASA Designation—"N"
Suggested Current Range: 0-85 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	0.35 oz.
Volume	0.18 cubic inches
Cell	One No. 304 (ASA "N")

For service information see reverse side of this sheet

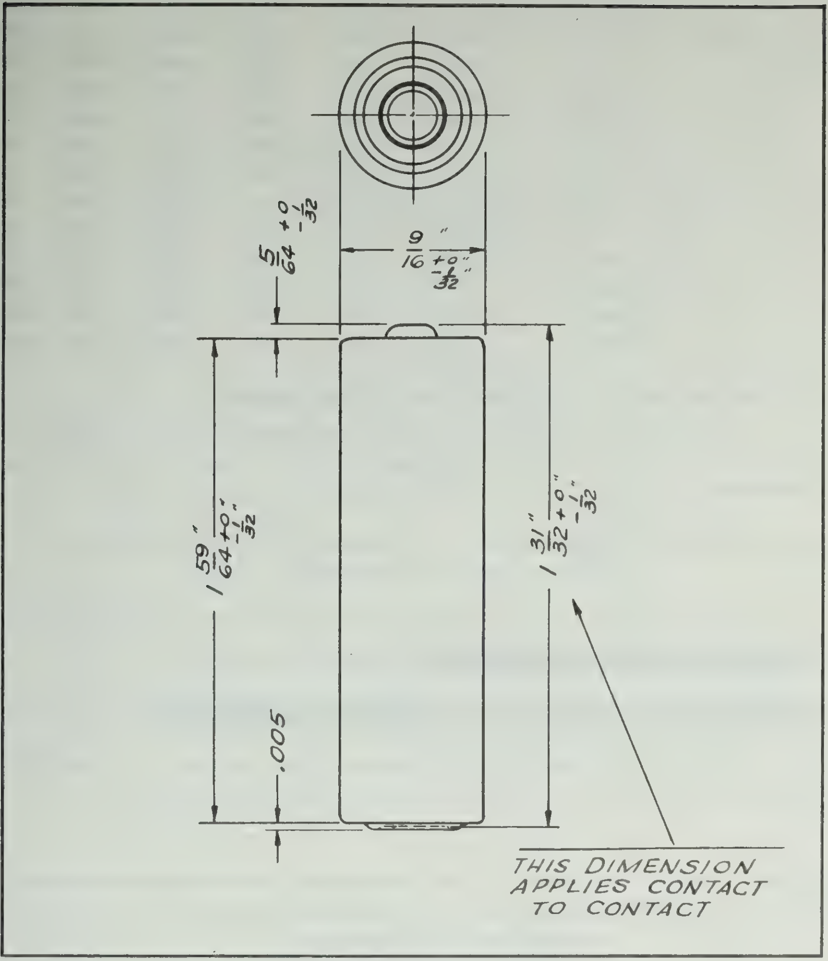
"EVEREADY" NO. E90

Estimated Hours Service at 70°F (Tentative)

SCHEDULE	STARTING DRAINS	LOAD	CUT-OFF VOLTAGE				
	(milliamperes)	(ohms)	0.8V	0.9V	1.0V	1.1V	1.2V
24 hrs./day	10	150	87	70	52	40	22
	100	15	4.1	3.2	1.7	0.75	0.2

"EVEREADY" NO. E91 CELL

Type — Alkaline
ASA Designation — "AA"
Suggested Current Range: 0-150 Milliamperes



SPECIFICATIONS

Voltage Taps	–, + 1.5
Terminals	Flat Contacts
Average Weight	0.75 oz.
Volume	0.48 cubic inch
Cell	One No. 315 (ASA "AA")

For service information see reverse side of this sheet

"EVEREADY" NO. E91

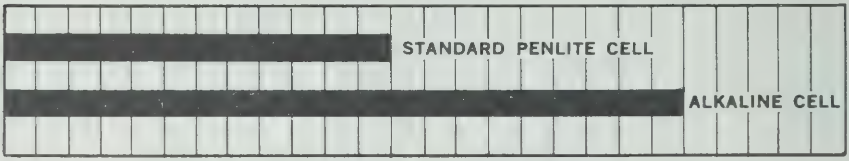
Estimated Hours Service at 70°F.

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 0.75V	0.8V	0.9V	1.0V	1.1V
24 hrs./day (or less)	1	1500	1570	1500	1330	1100	880
	5	300	400	375	340	290	230
	7.5	200	285	272	242	202	160
	10	150	215	190	174	155	102
	15	100	145	130	115	94	68
	20	75	100	93	83	70	57
	30	50	63	60	52	45	35
	50	30	38	34	30	25	18
	150	10	10.2	9.5	8.5	6.5	3.5
	350	4	3.7	3.0	2.5	1.7	0.8
	550	2.25	1.9	1.4	1.0	0.5	0.22
	1200	1.0	0.5	0.4	0.25	0.13	0.05

USE OF No. E91 IN POCKET TRANSISTOR RADIOS

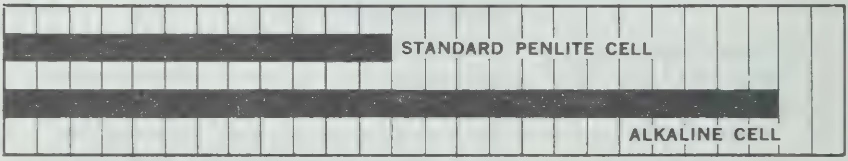
The "AA" size alkaline cell offers considerably more service in pocket transistor radios than the standard penlite cell. This is illustrated below for two conditions.

Current Drain—20 milliamperes Discharge Schedule—2 hrs./day
Cut-Off Voltage—0.8 volt/cell



Alkaline cell provides 75% more service than standard penlite cell

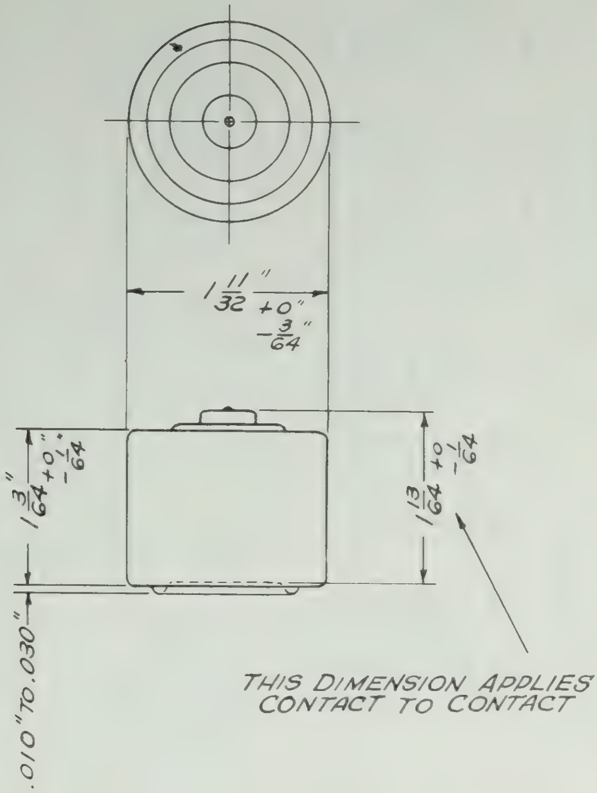
Current Drain—20 milliamperes Discharge Schedule—4 hrs./day
Cut-Off Voltage—0.8 volt/cell



Alkaline cell provides twice the service of standard penlite cell

"EVEREADY" NO. E94

Type — Alkaline
NEDA Number — 927
Suggested Current Range: 0-300 Milliamperes



SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	1.8 oz.
Volume	1.6 cubic inches
Cell	One No. 345

For service information see reverse side of this sheet

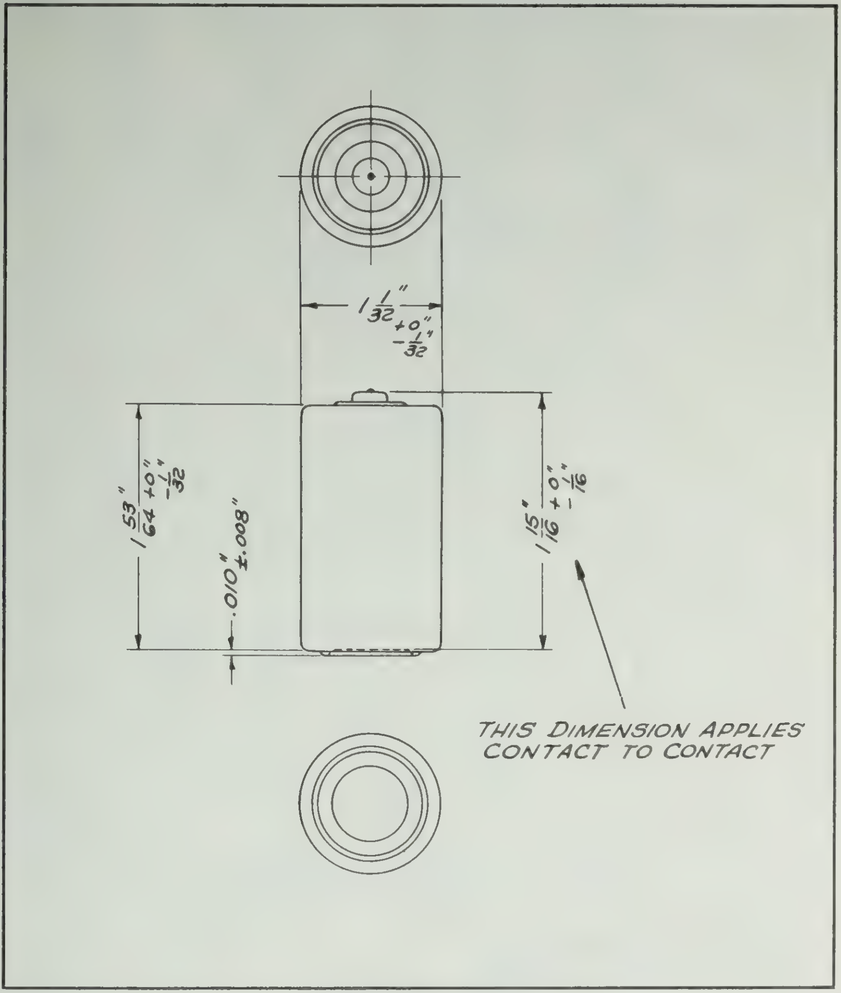
"EVEREADY" NO. E94

Estimated Hours Service at 70°F.

SCHEDULE	STARTING DRAINS (milli-amperes)	LOAD (ohms)	CUT-OFF VOLTAGE 0.5V	0.6V	0.7V	0.75V	0.8V	0.9V	1.0V	1.1V	1.2V
24 hrs./day (or less)	30	50	200	190	165	160	150	130	105	90	60
	150	10	40	38	34	32	29	25	19	12	6
	350	4	7.6	7.5	7.4	7.0	6	5	2.7	1.5	0.5
	600	2.4	4.8	4.5	4.3	4.0	2.7	1.9	0.8	0.35	
	637	2.25	4.5	4.2	4.0	3.7	2.5	1.8	0.75	0.33	
	1350	1.0	2.0	1.5	1.0	0.7	0.5	0.3	0.1		
	1500	0.9	1.8	1.3	0.9	0.6	0.4	0.25	0.05		
	2400	0.5	0.8	0.5	0.2	0.15	0.1	0.05	0.01		
4 min./hr. 8 hrs./day 16 hrs. rest (Light-Industrial Flashlight Test)	350	4						7.0		2.5	
4 min. every 15 min. 8 hrs./day 16 hrs. rest (Heavy Industrial Flashlight Test)	350	4						7.0		2.5	

"EVEREADY" NO. E93 CELL

Type — Alkaline
ASA Designation — "C"
Suggested Current Range: 0-480 Milliamperes



SPECIFICATIONS

Voltage Taps	−, + 1.5
Terminals	Flat Contacts
Average Weight	2.0 oz.
Volume	1.25 cubic inches
Cell	One No. 335 (ASA "C")

For service information see reverse side of this sheet

"EVEREADY" NO. E93

Estimated Hours Service at 70°F (Tentative)

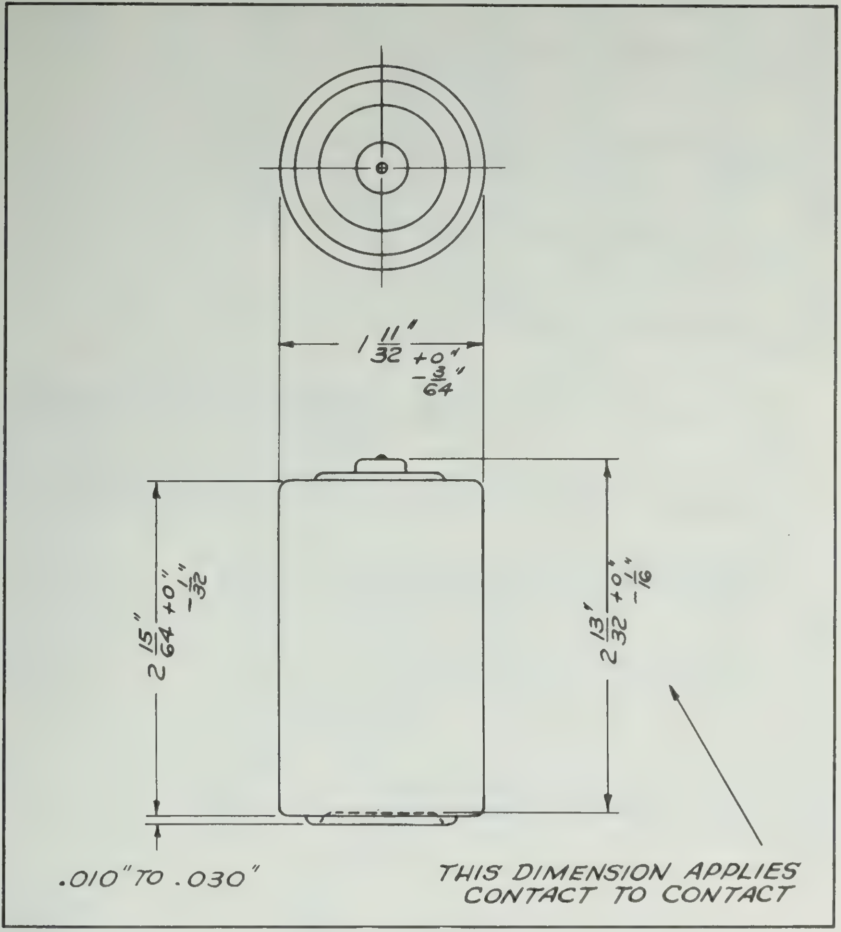
SCHEDULE	STARTING DRAIN (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE						
			0.6V	0.75V	0.8V	0.9V	1.0V	1.1V	1.2V
4 hrs./day	18	83.3	355		303		224		
	37.5	40	180		147		106		
	60	25	110		92		67		
24 hrs./day	30	50			181	161	133	112	74
	300	5			16.5	12.5	9.4	5.2	1.6
	375	4		14.3					
	667	2.25		7.7					
	1000	1		1.9					

"EVEREADY" NO. E95 CELL

Type — Alkaline

ASA Designation — "D"

Suggested Current Range: 0-650 Milliamperes



SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Flat Contacts
Average Weight	4.3 oz.
Volume	3.17 cubic inches
Cell	One No. 350 (ASA "D")

For service information see reverse side of this sheet

"EVEREADY" NO. E95

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE								
			0.5V	0.6V	0.65V	0.7V	0.8V	0.9V	1.0V	1.1V	1.2V
24 hrs./day (or less)	10	150	1440	1350	1300	1230	1100	1080	1020	850	600
	30	50	480	450	435	410	380	360	340	285	210
	50	30	280	260	250	240	215	195	164	129	48
	150	10	93	88	85	80	70	65	55	43	16
	200	7.5	70	66	63	58	47	40	29	19	7
	300	5	48	44	42	38	33	27	19	12.5	4.7
	350	4	41	38	36	33.3	28.4	23	16.7	10.8	4
	375	3.75	37	34	32	30	24	18.5	13.6	7.5	
	600	2.4	23.5	21	20	19	15	12	9	4.5	
	637	2.25	22	20	19	15	14	11	8	4	
	1350	1.0	8	7.5	6.2	5	4.5	2.5	1.0	0.4	
	1500	0.85	6.4	5.9	5.0	4.0	3.7	2.0	0.8	0.3	
	2400	0.5	3.7	3.5	3.3	2.5	2.0	1.0	0.25	0.1	
	3000	0.35	2.2	2.1	2.0	1.7	1.2	0.6	0.15		
	4000	0.25	2.0	1.5	1.3	1.0	0.58	0.2	0.1		
	6500	0.15	0.67		0.25						
4 min./hr. 8 hrs./day, 16 hrs. rest, (Light-Industrial Flashlight Test)	637	2.25			17.0						
4 min. every 15 min., 8 hrs./day, 16 hrs. rest, (Heavy-Industrial Flashlight Test)	350	4						24.1		15.5	
8 Amperes (starting) for 8 seconds — 2.2 amperes (starting) for next 52 seconds — this cycle repeated continuously to 0.6V cut-off (Electronic Photoflash Test)				180 Flashes							

"EVEREADY" NO. E96 CELL

(See "Cell Sizes Available In Future" In Text)

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE			
			0.8V	0.9V	1.0V	1.1V
24 hrs./day (or less)	30	50	720	660	500	440
	150	10	128	110	91	76
	375	4	46	41	34	25
	670	2.25	23	21.8	18	12
	1200	1.25	11.3	9.5	7.1	4.7
	1500	1.0	9.0	7.5	5.7	3.8
	2000	0.75	6.6	5.5	3.3	0.8
	3000	0.5	3.8	2.8	1.5	0.3

"EVEREADY" NO. E97 CELL

(See "Cell Sizes Available In Future" In Text)

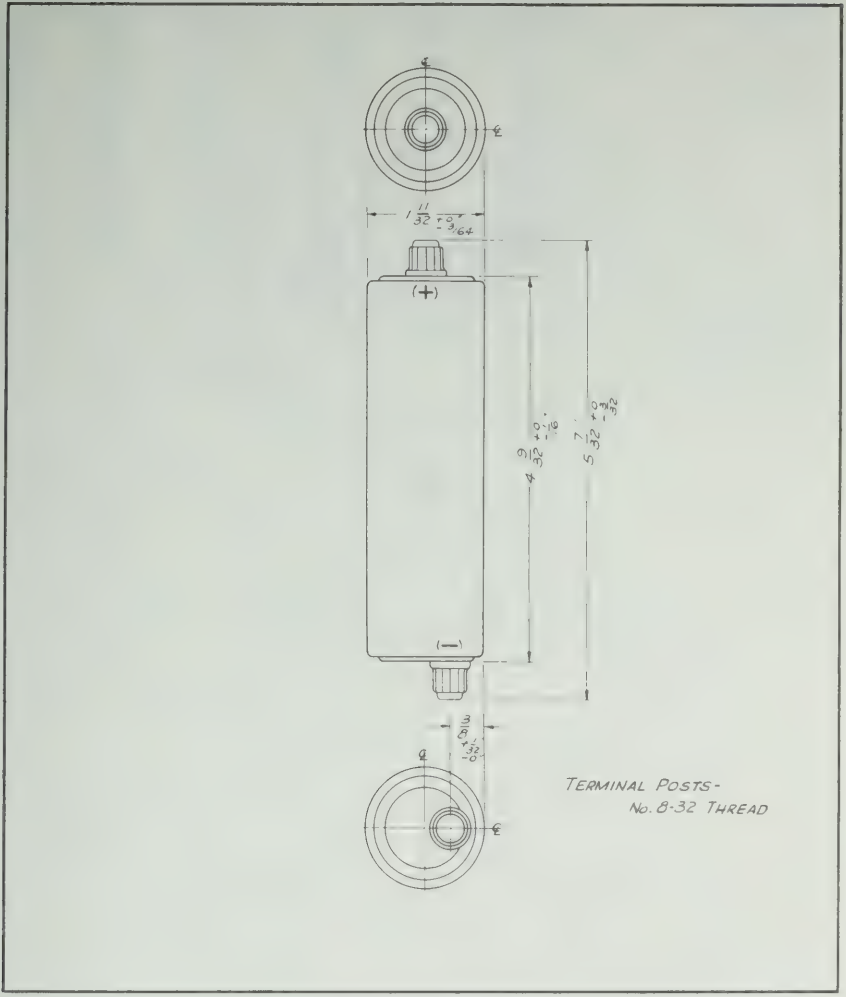
Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE			
			0.8V	0.9V	1.0V	1.1V
24 hrs./day (or less)	30	50	960	880	670	600
	150	10	170	140	120	100
	375	4	60	53	45	34
	670	2.25	32	29	24	16
	1200	1.25	15	12.6	9.5	6.5
	1500	1.0	11	9	7.5	5.0
	2000	0.75	8.8	7.3	4.6	1.3
	3000	0.5	5.5	4.0	2.1	0.6

"EVEREADY" NO. E97S CELL

Type — Alkaline

Suggested Current Range: 0-1300 Milliamperes



SPECIFICATIONS

Voltage Taps	—, + 1.5
Terminals	Plastic Knurls
Average Weight	8 oz.
Volume	6.1 cubic inches
Cell	One No. 364 (ASA "G")

For service information see reverse side of this sheet

"EVEREADY" NO. E97S

Estimated Hours Service at 70°F

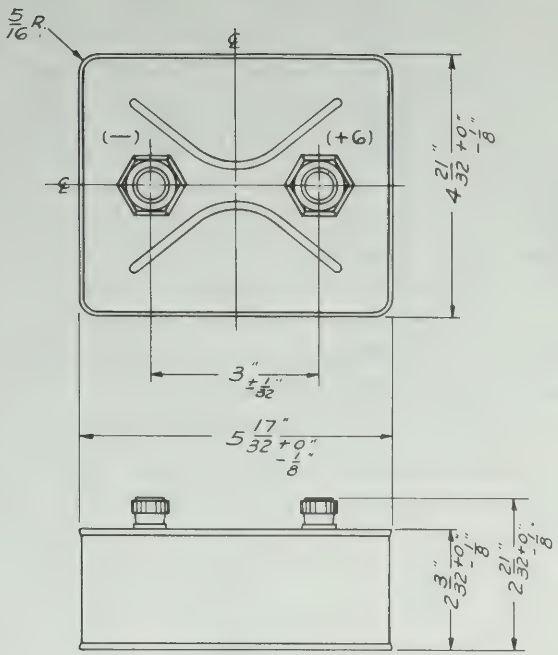
SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE			
			0.8V	0.9V	1.0V	1.1V
24 hrs./day (or less)	30	50	960	880	670	600
	150	10	170	140	120	100
	375	4	60	53	45	34
	670	2.25	32	29	24	16
	1200	1.25	15	12.6	9.5	6.5
	1500	1	11	9	7.5	5.0
	2000	0.75	8.8	7.3	4.6	1.3
	3000	0.5	5.5	4.0	2.1	0.6
5 minutes on, 15 minutes off — 8 hrs./day (Glo-Plug Ignition)	4.0 Amps	0.32		15 cycles (75 min.)		

"EVEREADY" NO. 520 BATTERY

Type — Alkaline

NEDA Number — 930

Suggested Current Range: 0-1300 Milliamperes



TERMINAL POSTS - No. 8-32 THREAD

SPECIFICATIONS

Voltage Taps .... —, + 6
Terminals .... Insulated Knurls
Average Weight .... 2 lbs. 8 oz.
Volume .... 53.9 cubic inches
Cells .... Four No. 364 (ASA "G") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 520

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE			
			3.2V	3.6V	4.0V	4.4V
24 hrs./day (or less)	30	200	960	880	670	600
	150	40	170	140	120	100
	375	16	60	53	45	34
	670	9	32	29	24	16
	1200	5	15	12.6	9.5	6.5
	1500	4	11	9	7.5	5.0
	2000	3	8.8	7.3	4.6	1.3
	3000	2	5.5	4.0	2.1	0.6
30 min. on, 30 min. off, for 8 hrs./day (Total of 4 hrs. on)	1330			13	9	
6 hrs./day	667			28	24	
6 hrs./day	1330			13	9	

Alkaline Secondary Batteries

"Eveready" alkaline secondary batteries are a unique new rechargeable power source. They use a new electrochemical system and are maintenance free, hermetically sealed, and will operate in any position. These batteries have been specifically designed for electronic and electrical applications where low initial cost and a low operating cost are of paramount importance. They are particularly suited for portable battery-operated television and portable phonographs.

"Eveready" alkaline secondary batteries are an outgrowth of the heavy duty "Eveready" alkaline primary energizers ("Eveready" E94 and E95 batteries). Further research and development has made possible an alkaline battery that can be recharged. The total number of times the "Eveready" alkaline secondary battery can be recharged is less than can be obtained with the nickel-cadmium rechargeable system, but the initial cost is only a fraction of nickel-cadmium battery cost. This provides an inexpensive battery that in many cases also offers lower operating cost than can be obtained from nickel-cadmium batteries.

The individual cells that comprise the alkaline secondary battery use electrodes of zinc and manganese dioxide with an electrolyte of potassium hydroxide. These are put together in a special inside-out cell construction. Each individual cell is then hermetically sealed. Each cell has a nominal voltage of 1.5 and they are made in 3 sizes – D, F and G. Basic characteristics of these cells are shown in Table A.

Table A

BASIC CHARACTERISTICS OF CELLS IN
"EVEREADY" ALKALINE SECONDARY BATTERIES

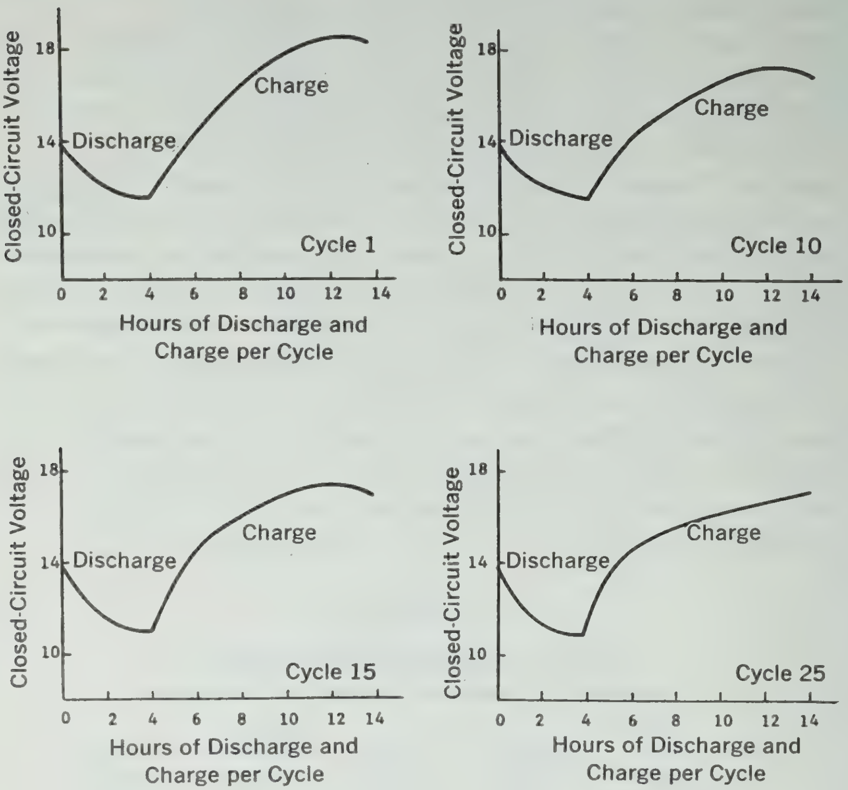
Cell Size	Nominal Voltage	Average Operating Voltage	Rated Ampere-Hour Capacity	Maximum Recommended Discharge Current	Recommended Charging Current
D	1.5	1.0–1.2	2.0	0.5 amp	0.25 amp
F	1.5	1.0–1.2	3.2	0.8 amp	0.4 amp
G	1.5	1.0–1.2	4.0	1.0 amp	0.5 amp

Finished batteries are constructed by connecting the required number of the proper cell size in series and sealing them in a metal can.

The discharge characteristic of the "Eveready" secondary alkaline cell battery is similar to that of a primary battery. The battery voltage slowly decreases as power is withdrawn from the battery. The shape of this discharge curve changes slightly as the battery is repeatedly charged and discharged. The total voltage drop for a given power withdrawal increases as the number of charge and discharge cycles increases. Typical discharge and charge curves are shown in Table B.

Table B

TYPICAL INDIVIDUAL DISCHARGE AND CHARGE CURVES OF AN "EVEREADY" ALKALINE BATTERY, RECHARGEABLE SERIES #1 — CONTAINING TEN "D", "F", OR "G" CELLS



Cell Size	Load Resistance (ohms/cell)	Charge Rate (milliamperes)
D	2.25	250
F	1.40	400
G	1.125	500

Discharge Cycle: 4 hours
Charge Cycle: 10 hours

When one of these new alkaline secondary batteries is discharged for 4 hours at the maximum recommended discharge current and then recharged for 10 hours at the recommended charging current, the complete discharge and charge cycle can be repeated approximately

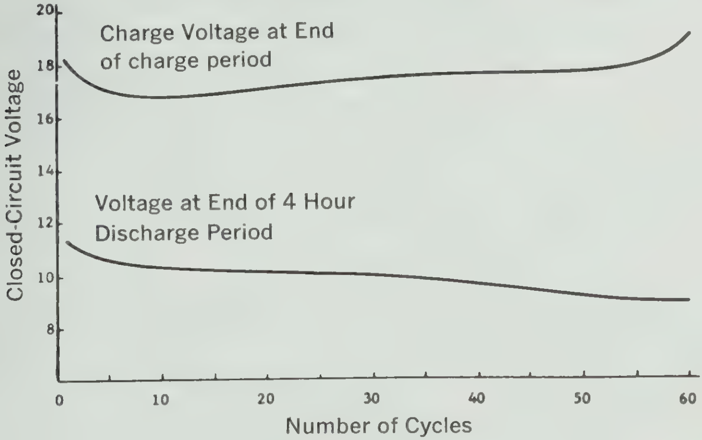
50 times before the battery will fall below 0.9 volts per cell in any 4 hour discharge period. Decreasing either the discharge current, or the total ampere hour withdrawal, or both, will increase the cycle life of the battery more than proportionately. Conversely, if the power demands are increased, the cycle life will decrease more than in proportion to the increased power demand.

During the early part of its cycle life there is a very large power reserve in an "Eveready" secondary alkaline battery. This usually amounts to between 100% and 200% of the rated ampere-hour capacity of the battery. During these early cycles, the battery terminal voltage may measure 1.1 to 1.2 volts per cell after the battery has delivered its rated ampere-hour capacity. If it is discharged beyond its rated capacity total battery life will be reduced. However, this reserve power can be used in situations where immediate power is more important than maximum total battery life.

During the latter part of the cycle life, there is little or no reserve power and the terminal voltage of the battery will fall to between 0.9 and 1.0 volt per cell. Table C shows the minimum voltage that a battery will reach at the end of the recommended discharge period and also the maximum voltage that it will reach during the subsequent charge period. Both voltages are measured while the discharge or charge current is flowing.

Table C

TYPICAL INDIVIDUAL DISCHARGE AND CHARGE CURVES OF AN "EVEREADY" ALKALINE BATTERY, RECHARGEABLE SERIES #1 — CONTAINING TEN "D", "F", OR "G" CELLS



Cell Size	Load Resistance (ohms/cell)	Charge Rate (milliamperes)
D	2.25	250
F	1.40	400
G	1.125	500

Discharge Cycle: 4 hours
Charge Cycle: 10 hours

For best results, it is recommended that an "Eveready" alkaline secondary battery be recharged by applying the recommended charging current for a time long enough to replace 120% of the ampere-hours removed on the previous discharge. This figure is not critical. It may be varied between 100% and 150% or more without seriously reducing service life. Since the maximum voltage that the battery reaches while it is being charged depends on its previous history and the number of recharge cycles it has received, (see Table C), constant voltage charging techniques cannot be used successfully. Proper charging must be based on time or ampere-hour control methods.

These new batteries may be overcharged at the recommended charging current for many, many hours. At reduced currents, they may be overcharged for much longer periods. For best results, however, it is recommended that overcharging be kept to a minimum.

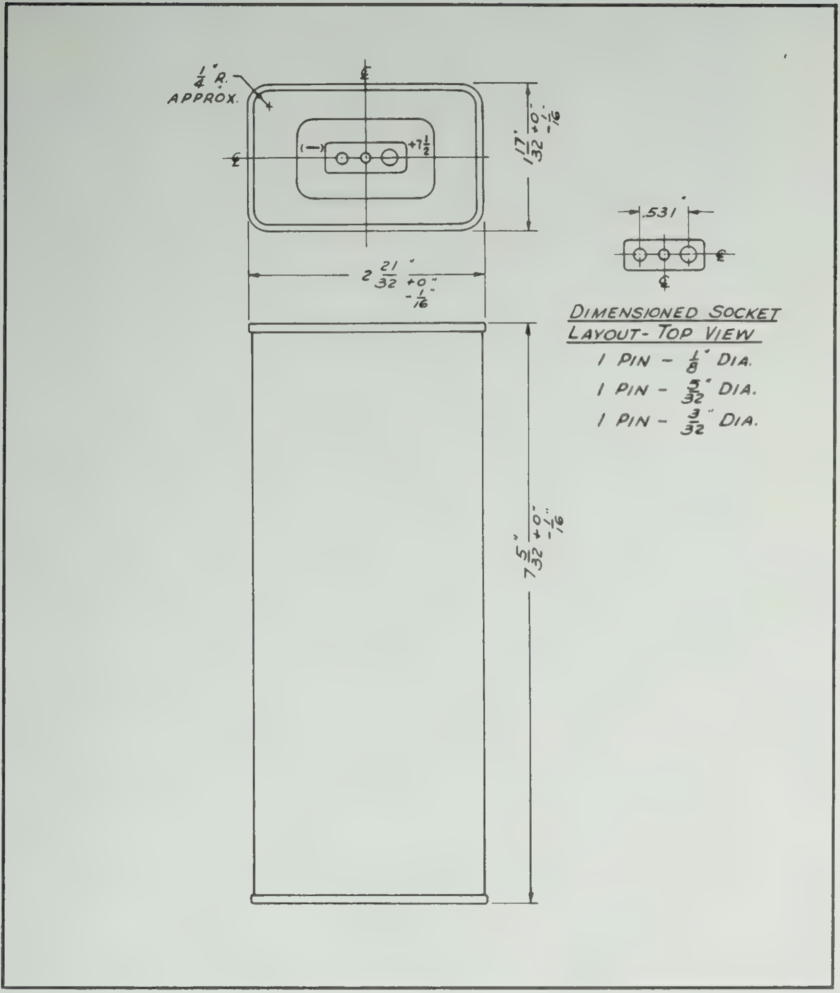
"Eveready" alkaline secondary batteries have excellent charge retention characteristics. A new battery is shipped fully charged and has the charge retention characteristics of a primary battery. It must be discharged to its rated capacity before it will be capable of standing much overcharge. This is important; *discharge the battery before charging it.*

The "Eveready" alkaline secondary battery must not be discharged completely. (It should not be permitted to drop below a voltage value of 0.9 volt per cell or 9 volts for a 10 cell, 15 volt, battery, for example.) During extremely deep discharges (to 0.2 – 0.4 volt per cell) a secondary electrochemical reaction takes place. This reaction is not reversible and it will be impossible to recharge the battery. To avoid possible customer complaints of short battery service, it is therefore desirable that the instrument using the battery contain some automatic provision against complete discharge of the battery. The best system would involve the use of a DC timer or ampere-hour counter to control both the discharge and the charge cycles. A system of this sort would insure the maximum battery service life. Although the protection is less effective, it is also possible to use a differential relay circuit to protect the battery against deep discharge.

Further information on this new rechargeable battery system and charger circuits may be obtained by writing to the Battery Engineering Department.

"EVEREADY" NO. 560 BATTERY

Type — Alkaline Secondary (Rechargeable)



SPECIFICATIONS

Voltage Taps	−, + 7.5
Terminals	Socket
Average Weight	1 lb. 9 oz.
Volume	29.0 cubic inches
Cells	Five No. 350 (ASA "D") in series

For service information see reverse side of this sheet

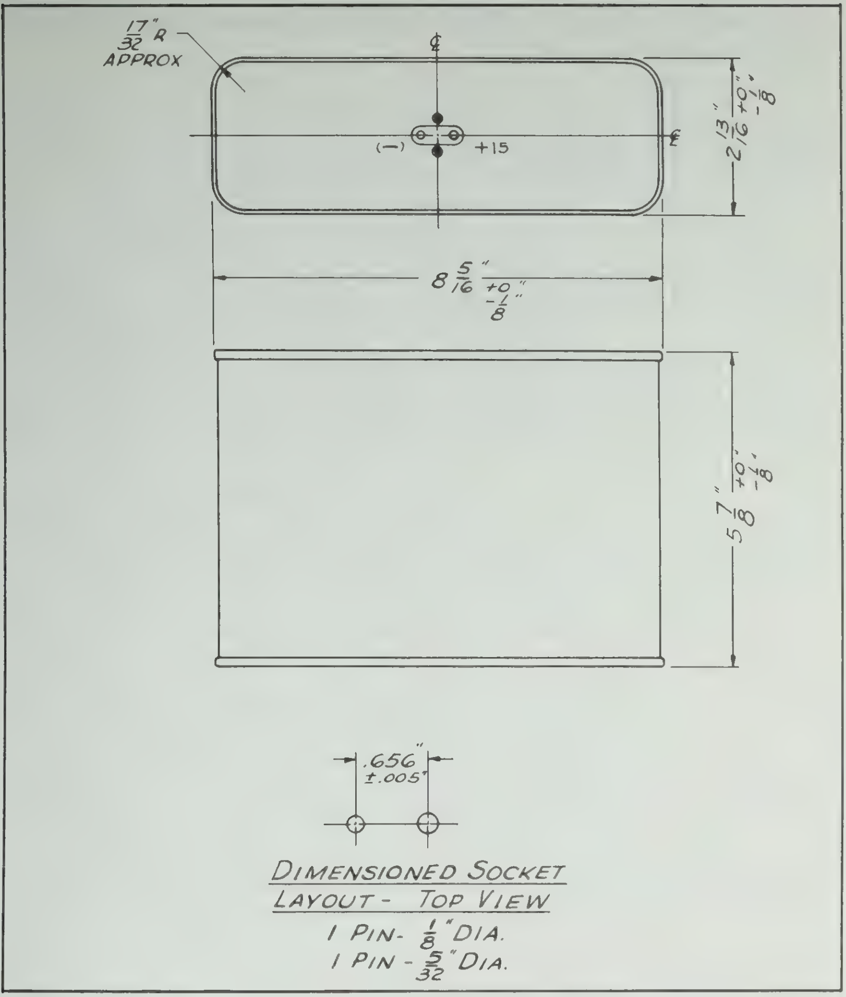
"EVEREADY" NO. 560

Service Data

This Battery utilizes five size "D" Alkaline Secondary cells in series. Refer to the write-up on Alkaline Secondary Batteries for characteristics of the size "D" Cell.

"EVEREADY" NO. 561 BATTERY

Type—Alkaline Secondary (Rechargeable)



SPECIFICATIONS

Voltage Taps	—, + 15
Terminals	Socket
Average Weight	6 lbs.
Volume	137 cubic inches
Cells	Ten No. 364 (ASA "G") in series

For service information see reverse side of this sheet

"EVEREADY" NO. 561

SERVICE DATA

This battery utilizes ten size "G" Alkaline Secondary Cells in series. Refer to the write-up on Alkaline Secondary Batteries for characteristics of the size "G" cell.

Alkaline Transistor Radio Batteries

No. 523—4.5 volts

The alkaline transistor radio batteries described on the following pages represent a radically new concept in battery packaging. The traditional lock seam, thick wall plastic or paper outer container has been eliminated to make available a maximum amount of internal volume for active battery components.

The individual cells used in the batteries are a result of over ten years of concentrated Research and Development effort aimed at maximizing energy density and minimizing cell impedance.

Based on extensive experimental studies of existing small size transistor radios, the drain carrying capabilities of these batteries are well in excess of actual requirements even under most severe use conditions.

PRODUCT CHARACTERISTICS:

1. "Eveready" alkaline transistor radio batteries exhibit exceptional current drain carrying capabilities.
2. Battery impedance is low and essentially constant even to low voltage cutoffs.
3. Shelf life characteristics are excellent.
4. Batteries are leakproof and free from salting.
5. Battery capacity is nearly constant at withdrawal rates of 2 to 6 hours per day.
6. No hazards to equipment exist when cells are allowed to discharge continuously in the sets below normal cutoffs.

SHELF LIFE:

Shelf life of "Eveready" alkaline batteries is excellent. After one year storage at 70° F., these batteries can be expected to supply in excess of 90% of their rated capacity.

ABUSE TESTING:

The construction used in the "Eveready" No. 523 battery has been subjected to a variety of abuse type tests such as:

1. Continual shorting
2. Continual discharge
3. High temperature storage
4. High temperature-high humidity storage
5. Shock and vibration
6. Temperature cycling between −20° F. to 140° F.

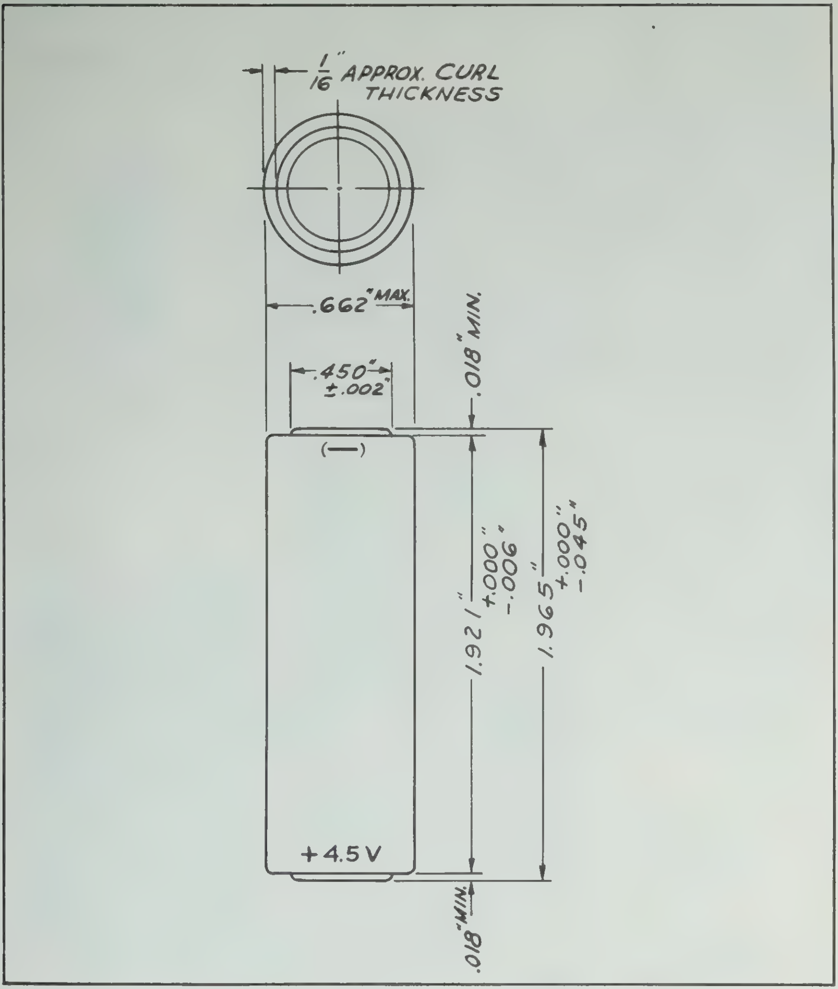
On the basis of these and other tests, "Eveready" alkaline transistor radio batteries present no hazard to personnel or equipment.

It is recommended that these batteries not be disposed of in a fire, and that they not be charged. These precautions are not peculiar to these specific batteries, but are general safety procedures which should be followed in handling primary sealed alkaline batteries.

"EVEREADY" NO. 523 BATTERY

Type—Alkaline

Suggested Current Range: 0-70 milliamperes



SPECIFICATIONS

Voltage Taps	—, + 4.5
Terminals	Flat Contacts
Average Weight	1.17 oz.
Volume	0.67 cubic inch
Cells	Three No. 663 in series

For service information see reverse side of this sheet

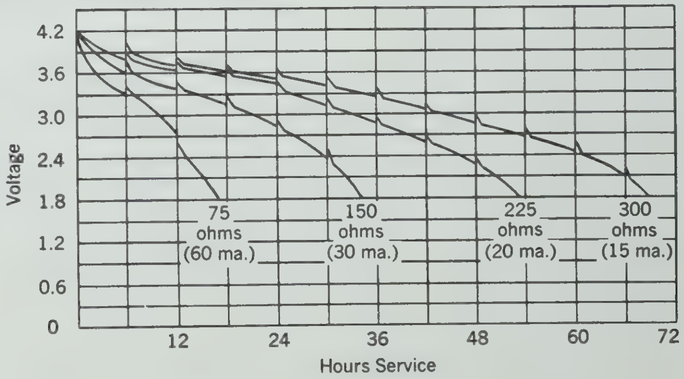
"EVEREADY" NO. 523

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAIN (milliamperes)	LOAD	CUT-OFF VOLTAGE					
			1.8V	MILLIAMPERE-HOUR CAPACITY	2.4V	MILLIAMPERE-HOUR CAPACITY	3V	MILLIAMPERE-HOUR CAPACITY
6 hrs./day	15 ma	300 ohms	69 hrs.	775 mah	61 hrs.	710 mah	42 hrs.	515 mah
	20 ma	225 ohms	53 hrs.	763 mah	46 hrs.	690 mah	32 hrs.	500 mah
	30 ma	150 ohms	34 hrs.	720 mah	29 hrs.	633 mah	21 hrs.	483 mah
	60 ma	75 ohms	17 hrs.	680 mah	13 hrs.	566 mah	9 hrs.	403 mah

With schedule of 2 hours/day, service hours listed increase 1% to 2%
With schedule of 24 hours/day, service hours listed decrease about 5%

VOLTAGE DISCHARGE CHARACTERISTICS—6 HOUR/DAY DISCHARGE AT 70° F



IMPEDANCE

The impedance of the "Eveready" No. 523 battery ranges from 2.7-4.5 ohms and is nearly constant throughout a given discharge even to a 1.8 volt cutoff. This relationship exists over a wide range of drains, 10 to 60 milliamperes, and frequencies, 40 to 1000 cycles per second.

Nickel-Cadmium
BATTERIES

BUTTON

CYLINDRICAL

RECTANGULAR

Nickel-Cadmium Batteries

The nickel-cadmium battery is a remarkable device. More than fifty years of successful use have proved this point. Nickel-cadmium batteries may be recharged many times, have a relatively constant potential during discharge, and have excellent charge retention properties. They will stand more abuse than any other cell, have good low temperature performance characteristics, and are competitive with other systems in terms of cost per hour of use. They are true storage batteries using one of the very best electrochemical systems.

The Sealed Nickel-Cadmium Cell

The nickel-cadmium cell has been used in Europe for many years in its original form, as an unsealed cell. Recent technological advances have made possible the extension of the nickel-cadmium system to small, hermetically sealed batteries – rechargeable batteries that are free of the usual routine maintenance, such as the addition of water. These developments have brought the economic advantages of rechargeability to small batteries.

"Eveready" sealed nickel-cadmium cells can be recharged many times to give long useful life, and are not adversely affected by long standing, either charged or discharged.

These high quality batteries use expensive active raw materials and a complicated construction. When used within their recommended ratings, in applications where the use of rechargeable cells is justified, "Eveready" nickel-cadmium cells will provide satisfactory, economical, trouble-free service. New portable devices requiring more energy than is economically available from primary batteries are now practical and possible with this new complete line of rechargeable batteries.

Applications

"Eveready" sealed nickel-cadmium batteries are ideally suited for use in many types of battery-operated equipment. Some of the many applications are listed here.

- ELECTRONIC PHOTOFLASH
- DICTATING MACHINES
- ELECTRIC SHAVERS
- TAPE RECORDERS
- INSTRUMENTS
- ALARM SYSTEMS
- TRANSISTOR RADIOS
- TRANSMITTERS
- RECEIVERS
- MOVIE CAMERAS
- EMERGENCY LIGHTING
- HEARING AIDS
- AMPLIFIERS
- TELEMETERING

Operation of the Sealed Nickel-Cadmium Battery

Any secondary cell is a combination of active materials which can be electrolytically oxidized and reduced repeatedly. The oxidation of the negative electrode occurring simultaneously with the reduction of the positive generates electric power. In a rechargeable battery both electrode reactions are reversible and the input of current in the proper direction from an outside source will drive the primary or discharge reaction backwards and in effect recharge the electrodes.

In the charged condition the positive electrode of a nickel-cadmium cell is nickelic hydroxide, the negative metallic cadmium. The electrolyte is potassium hydroxide. The average operating voltage of the cell under normal discharge conditions is about 1.2 volts. The overall chemical reaction of the nickel-cadmium system can be considered as:

$$\mathrm{Cd} + 2\mathrm{NiOOH} + 2\mathrm{KOH} \rightleftharpoons \mathrm{Cd\,(OH)_2} + 2\mathrm{NiO} + 2\mathrm{KOH}$$

The electrodes used in sealed cells of button and cylindrical configurations consist of molded screen-encased active materials. In the rectangular cells the plates consist of pressed active materials held in perforated steel pockets locked into welded frames.

During the latter part of a recommended charge cycle and during overcharge, nickel-cadmium batteries generate gas. Oxygen is generated at the nickel electrode after it becomes fully charged and hydrogen is formed at the cadmium electrode when it reaches full charge.

A conventional vented type nickel-cadmium battery will liberate oxygen and hydrogen plus entrained electrolyte fumes through a valve.

In order to hermetically seal a nickel-cadmium cell it is necessary to develop means of using up this gas inside the cell. This is accomplished as follows:

1. The battery is constructed with excess ampere-hour capacity in the cadmium electrode.
2. Starting with both electrodes in the fully discharged state, charging the battery causes the positive (nickel) electrode to reach full charge first and it starts oxygen generation. Since the negative (cadmium) electrode has not yet reached full charge it cannot cause hydrogen to be generated.
3. The cell is designed so that the oxygen formed can reach the surface of the metallic cadmium electrode where it reacts, forming electrochemical equivalents of cadmium oxide.
4. Thus in overcharge the cadmium electrode is oxidized at a rate just sufficient to offset input energy, keeping the cell in equilibrium at full charge.

This process can continue for long periods. The level of oxygen pressure thus established in the cell is determined by the charge rate used.

"Eveready" Sealed Nickel-Cadmium Rechargeable Batteries

"Eveready" nickel-cadmium cells are available in three basic configurations — button, cylindrical, and rectangular. The range of capacities for each type is as follows:

BUTTON:	**50-500 MILLIAMPERE-HOURS**
CYLINDRICAL:	**450-2000 MILLIAMPERE-HOURS**
RECTANGULAR:	**1.5-23 AMPERE-HOURS**

Table 1

NICKEL-CADMIUM BATTERY
ELECTRICAL CHARACTERISTICS

"EVEREADY" BATTERY NUMBER	VOLTAGE	NOMINAL CAPACITY (10 HOUR RATE)	DISCHARGE CURRENT (10 HOUR RATE)	CHARGE FOR 14 HOURS AT NOT MORE THAN	CHARGING VOLTAGE	AVERAGE OPERATING VOLTAGE (10 HOUR RATE)	CUT-OFF VOLTAGE (10 HOUR RATE)
N22	1.25	20 mah	2 ma.	2 ma.	1.35-1.50	1.22	1.10
N24	1.25	50 mah	5 ma.	5 ma.	1.35-1.50	1.22	1.10
N26	1.25	100 mah	10 ma.	10 ma.	1.35-1.50	1.22	1.10
N26T	1.25	100 mah	10 ma.	10 ma.	1.35-1.50	1.22	1.10
N28	1.25	150 mah	15 ma.	15 ma.	1.35-1.50	1.22	1.10
N28T	1.25	150 mah	15 ma.	15 ma.	1.35-1.50	1.22	1.10
N32	1.25	225 mah	22 ma.	22 ma.	1.35-1.50	1.22	1.10
N32T	1.25	225 mah	22 ma.	22 ma.	1.35-1.50	1.22	1.10
N33	1.25	225 mah	22 ma.	22 ma.	1.35-1.50	1.25	1.10
N33T	1.25	225 mah	22 ma.	22 ma.	1.35-1.50	1.25	1.10
N36	1.25	450 mah	45 ma.	45 ma.	1.35-1.50	1.22	1.10
N36T	1.25	450 mah	45 ma.	45 ma.	1.35-1.50	1.22	1.10
N46	1.25	450 mah	45 ma.	45 ma.	1.35-1.50	1.20	1.10
N45	1.25	450 mah	45 ma.	45 ma.	1.35-1.50	1.20	1.10
N38	1.25	500 mah	50 ma.	50 ma.	1.35-1.50	1.22	1.10
N38T	1.25	500 mah	50 ma.	50 ma.	1.35-1.50	1.22	1.10
N52	1.25	900 mah	90 ma.	90 ma.	1.35-1.50	1.20	1.10
N39	1.25	1000 mah	100 ma.	100 ma.	1.35-1.50	1.22	1.10
N40	1.25	1000 mah	100 ma.	100 ma.	1.35-1.50	1.24	1.10
N40T	1.25	1000 mah	100 ma.	100 ma.	1.35-1.50	1.24	1.10
N41	1.25	2000 mah	200 ma.	200 ma.	1.35-1.50	1.22	1.10
N41T	1.25	2000 mah	200 ma.	200 ma.	1.35-1.50	1.22	1.10
N56	1.25	2 ah	200 ma.	200 ma.	1.35-1.50	1.22	1.10
N73	1.25	2 ah	200 ma.	200 ma.	1.35-1.50	1.22	1.10
N43	1.25	3000 mah	300 ma.	300 ma.	1.35-1.50	1.22	1.10
N43T	1.25	3000 mah	300 ma.	300 ma.	1.35-1.50	1.22	1.10
N74	1.25	3.5 ah	350 ma.	350 ma.	1.35-1.50	1.22	1.10

Table 2

NICKEL-CADMIUM BATTERY

PHYSICAL CHARACTERISTICS

"EVEREADY" BATTERY NUMBER	NO. OF CELLS	TYPE	MAXIMUM DIMENSIONS — INCHES				WEIGHT
			DIA.	LENGTH	WIDTH	HEIGHT	
N22	1	Button—Do not stack	0.449			0.201	0.04 oz.
N24	1	Button—Do not stack	0.61			0.235	0.12 oz.
N26	1	Button	0.988			0.230	0.32 oz.
N26T	1	Button with solder tabs	0.988			As above plus tabs	0.32 oz.
N28	1	Button	0.988			0.252	0.4 oz.
N28T	1	Button with solder tabs	0.988			As above plus tabs	0.4 oz.
N32	1	Button	0.988			0.343	0.44 oz.
N32T	1	Button with solder tabs	0.988			As above plus tabs	0.44 oz.
N33	1	Button—double plate	0.988			0.347	0.46 oz.
N33T	1	Button—double plate With solder tabs	0.988			As above plus tabs	0.46 oz.
N36	1	Button	1.697			0.286	1.16 oz.
N36T	1	Button with solder tabs	1.697			As above plus tabs	1.16 oz.
N46	1	"AA" Size	17/32			1-31/32	0.8 oz.
N45	1	"AA" Size—With solder tabs	17/32			1-31/32	0.8 oz.
N38	1	Button-Double Plate	1.355			0.380	1 oz.
N38T	1	Button-Double Plate-with Solder Tabs	1.355			As above plus tabs	1 oz.
N52	1	Long cylindrical-solder tabs	17/32			3-35/64	1.4 oz.
N39	1	Button	1.984			0.394	2 oz.
N40	1	Button—double plate	1.984			0.394	2 oz.
N40T	1	Button—double plate With solder tabs	1.984			As above plus tabs	2 oz.
N41	1	Button	1.984			0.719	3.4 oz.
N41T	1	Button with solder tabs	1.984			As above plus tabs	3.4 oz.
N56	1	"D" Size	$1\frac{11}{32}$			2-13/32	4.5 oz.
N73	1	Rectangular		1-23/64	1-23/64	2-13/32	5.9 oz.
N43	1	Button	1.984			0.988	4.8 oz.
N43T	1	Button with solder tabs	1.984			As above plus tabs	4.8 oz.
N74	1	Rectangular		1-23/64	1-23/64	3-25/64	9.2 oz.

Table 1

NICKEL-CADMIUM BATTERY
ELECTRICAL CHARACTERISTICS

"EVEREADY" BATTERY NUMBER	VOLTAGE	NOMINAL CAPACITY (10 HOUR RATE)	DISCHARGE CURRENT (10 HOUR RATE)	CHARGE FOR 14 HOURS AT NOT MORE THAN	CHARGING VOLTAGE	AVERAGE OPERATING VOLTAGE (10 HOUR RATE)	CUT-OFF VOLTAGE (10 HOUR RATE)
N75	1.25	4.5 ah	450 ma.	450 ma.	1.35-1.50	1.22	1.10
N76	1.25	6 ah	600 ma.	600 ma.	1.35-1.50	1.22	1.10
N77	1.25	7.5 ah	750 ma.	750 ma.	1.35-1.50	1.22	1.10
N79	1.25	11 ah	1.1 amps	1.1 amps	1.35-1.50	1.22	1.10
N81	1.25	15 ah	1.5 amps	1.5 amps	1.35.1.50	1.22	1.10
N83	1.25	19 ah	1.9 amps	1.9 amps	1.35-1.50	1.22	1.10
N85	1.25	23 ah	2.3 amps	2.3 amps	1.35-1.50	1.22	1.10
N67	6	900 mah	90 ma.	90 ma.	6.75-7.50	6.00	5.50
N70	6	1.5 ah	150 ma.	150 ma.	6.75-7.50	6.00	5.50

Note: N67 and N70 batteries have the same electrical characteristics as cylindrical and rectangular cells, respectively, except for the higher voltage.

Table 2

NICKEL-CADMIUM BATTERY

PHYSICAL CHARACTERISTICS

"EVEREADY" BATTERY NUMBER	NO. OF CELLS	TYPE	MAXIMUM DIMENSIONS — INCHES				WEIGHT
			DIA.	LENGTH	WIDTH	HEIGHT	
N75	1	Rectangular		2	1-23/32	3-5/32	12.3 oz.
N76	1	Rectangular		2	1-23/32	3-45/64	15.2 oz.
N77	1	Rectangular		2	1-23/32	4-1/4	1 lb. 1.6 oz.
N79	1	Rectangular		3-37/64	1-1/16	4-15/16	1 lb. 12 oz.
N81	1	Rectangular		3-37/64	1-25/64	4-15/16	2 lbs. 2.9 oz.
N83	1	Rectangular		3-37/64	1-45/64	4-15/16	2 lbs. 9.6 oz.
N85	1	Rectangular		3-37/64	2-1/64	4-15/16	3 lbs. 1.6 oz.
N67	5	Cylindrical Cells (N52) in Plastic Case		1-15/32	1-15/32	3-25/32	8.3 oz.
N70	5	Rectangular—Plastic Case		3-53/64	1-35/64	3-5/8	1 lb. 12 oz.

Note: Type numbers with suffix "T" have solder tabs spot welded to top and bottom faces of cell. N45 is identical physically to N46 except that two solder lugs on one end are used instead of flat contacts top and bottom.

Length of rectangular types and height of button types subject to +0.020" maximum temporary iincrease in dimension due to internal pressure.

Button Cells

A cutaway view of a typical button cell is shown in Figure 1. Specifications for all button cells are listed in Tables 1 and 2.

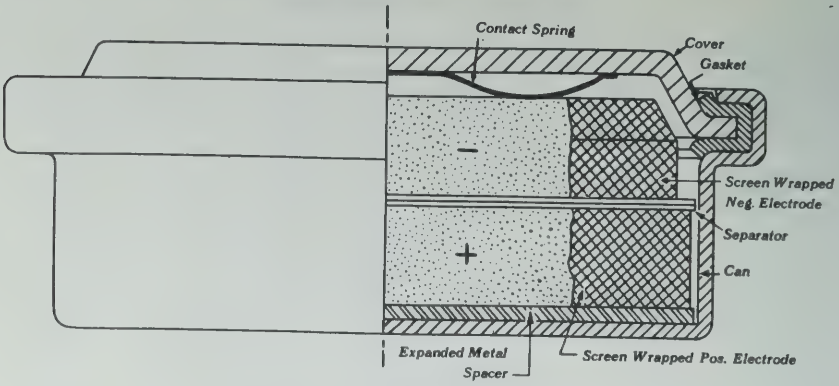


FIGURE 1

CUTAWAY OF TYPICAL BUTTON CELL

Excluding No. N24, these cells may be used individually or in series stacks. The N24 is not protected against polarity reversal and should be used only as a single cell. The reason for this is explained under "Electrical Characteristics." The discharge current for No. N24 should not exceed approximately 5 milliamperes.

Button cells may be used in a clip or holder or may be soldered into the circuit by means of small solder tabs welded on the top and bottom of the cell. Five of the button cells, Nos. N26T, N28T, N32T, N36T and N38T are supplied with solder tabs. *One should never attempt to solder directly to the cell case as the seal may be damaged by heat.*

Since the nickel-cadmium cell is a long-life device it can be considered an integral electronic component, as any other installed part, and wired directly into the circuit.

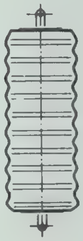
Button Cell Stack Assemblies

When required, two to ten button cells may be assembled into a higher voltage series stack by special factory welding techniques. The assembly is usually jacketed to improve rigidity and provide stack insulation. A typical assembly is shown in Figure 2.

FIGURE 2

BUTTON CELL STACK ASSEMBLY

It is not recommended that unit button cells be stacked in a pressure held assembly because of possible contact resistance changes in long term use. Cells should be assembled in the factory on a welded cell-to-cell basis.



Cylindrical Cells

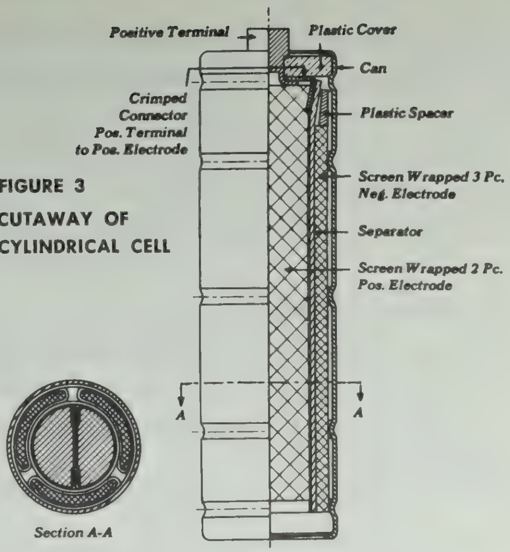

Positive Terminal
Plastic Cover
Can
Crimped Connector Pos. Terminal to Pos. Electrode
Plastic Spacer
Screen Wrapped 3 Pc. Neg. Electrode
Separator
Screen Wrapped 2 Pc. Pos. Electrode
A
A
Section A-A

FIGURE 3
CUTAWAY OF
CYLINDRICAL CELL

This cell type, which includes Nos. N45, N46, N52 and N56, incorporates a different electrode arrangement than the button cell. Internal construction features are shown in Figure 3. Specifications are shown in Tables 1 & 2.

The N46 is a direct replacement physically for the "AA" or penlite size dry cell. The N45 is identical physically to the N46 except that two solder lugs on one end are used instead of flat contacts top and bottom. The N52 is approximately twice the length and capacity of the N45. The N45 and N52 may be assembled into series packs of varying configurations. The N67 is a 6 volt pack consisting of 5 No. N52 cells in series.

Rectangular Cells

Rectangular (prismatic) types cover a range of capacity of 1.5–23 ampere-hours. Basic specifications are covered in Tables 1 and 2. Construction of the rectangular cell is detailed in Figure 4

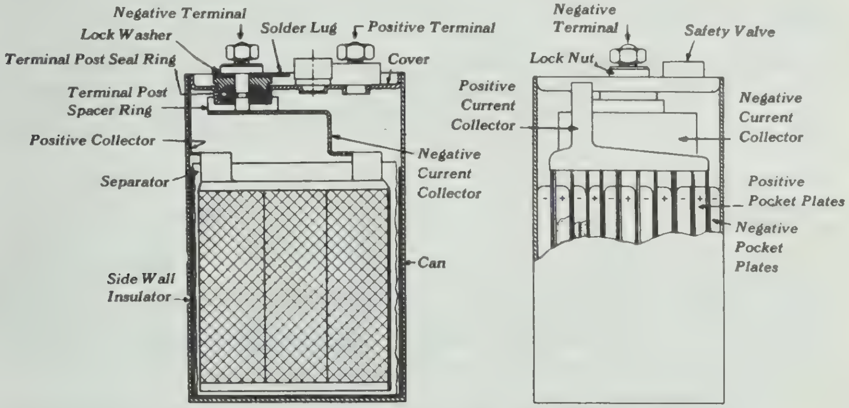


FIGURE 4 CUTAWAY OF TYPICAL RECTANGULAR CELL

The cell case of a rectangular cell is welded steel. The case contains a safety vent which is actuated only in the case of severe misuse of the cell. Connections are made to a nut and stud negative terminal and a welded tab positive terminal in the smaller cell sizes, and to a nut and stud for both positive and negative terminals in the larger cell sizes. The steel case is polarized positive for all rectangular cells.

Electrical Characteristics

"Eveready" sealed nickel-cadmium cells and batteries have a relatively constant discharge voltage. They can be recharged many times for long-lasting economical power. They are small, convenient packages of high energy output.

These cells never require the addition of water or electrolyte. They are hermetically sealed in steel cases, so there is no gassing and they require no maintenance. They have a long active life and an indefinite storage life. Long idle periods in either the charged or uncharged state do not adversely affect them. They are leakproof and will operate in any position.

These batteries have a very low internal impedance. They are rugged and have a high resistance to shock and vibration.

These cells have a wide range of operating temperature. At high temperatures, however, charging or discharging at higher than recommended rates, or repeated complete discharge of the cells to cutoffs lower than those recommended, adversely affect the cells by accelerating disintegration of the electrodes.

Graphic Data

The data presented on the following pages for capacity, voltage characteristics, self-discharge, temperature characteristics, and charging are tentative. Tests were conducted at 20°C, unless otherwise indicated.

Capacity

The capacity rating of "Eveready" nickel-cadmium batteries is based upon a discharge period of 10 hours (10 hour rate) and an end point voltage of 1.1 volts per cell. If current is withdrawn at a faster rate than this standard drain the capacity is decreased.

The following curves, Figures 5-12, show cell or battery capacity in relation to discharge current.

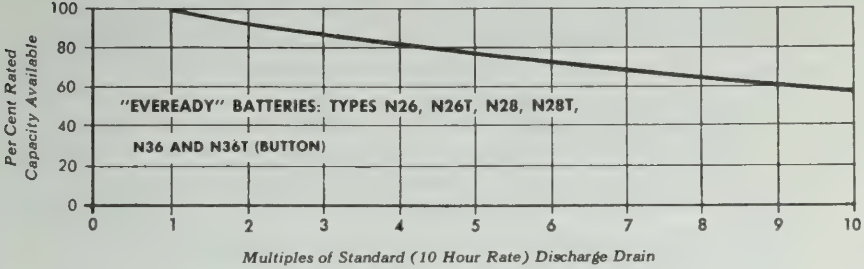
Note: Type N24 should be discharged only with currents up to the 10 hour rate. With this discharge current the cell voltages are:

Initial Voltage – 1.30 Volts
Average Voltage – 1.22 Volts
Final Voltage – 1.10 Volts

The method used in the sample calculation shown under Figure 5 can also be employed when using Figures 6–11.

Characteristic Sealed Nickel-Cadmium Cell Capacity At Various Drains

FIGURE 5: CAPACITY OF TYPES N26, N26T, N28, N28T, N36 AND N36T AT VARIOUS DRAINS



SAMPLE CALCULATION

Determine the milliampere-hours available from the N28 cell (a 150 milliampere-hour cell – see Table 1) at a drain of 60 ma.

$$\text{Standard Drain} = \frac{\text{Milliampere-hour Capacity}}{10} = 15 \text{ ma.}$$

$$\frac{\text{Proposed Drain (ma.)}}{\text{Standard Drain (ma.)}} = \frac{60}{15} = 4 = \text{multiple of Standard Drain.}$$

From curve above, 81% of the cell capacity is available at a current drain that is 4 times the standard discharge rate.

Thus, since 150 milliampere-hours is the rated capacity at 15 ma., 81% of 150, or 122 milliampere-hours is available from the cell at a 60 ma. drain.

FIGURE 6: CAPACITY OF TYPES N32 AND N32T AT VARIOUS DRAINS

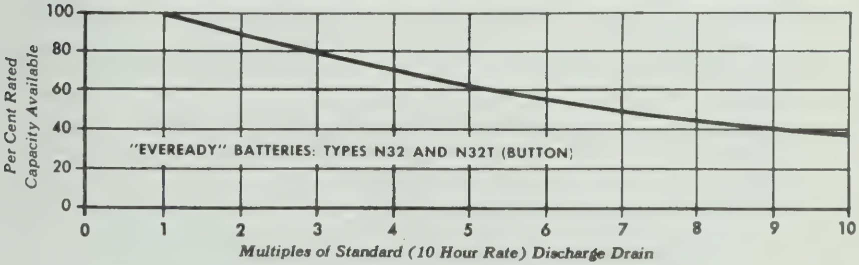


FIGURE 7: CAPACITY OF TYPES N33 AND N33T AT VARIOUS DRAINS

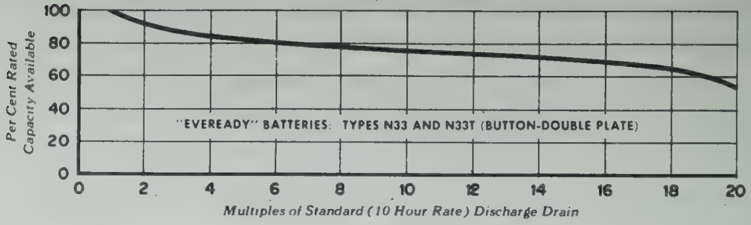


FIGURE 8: CAPACITY OF TYPES N38 AND N38T AT VARIOUS DRAINS

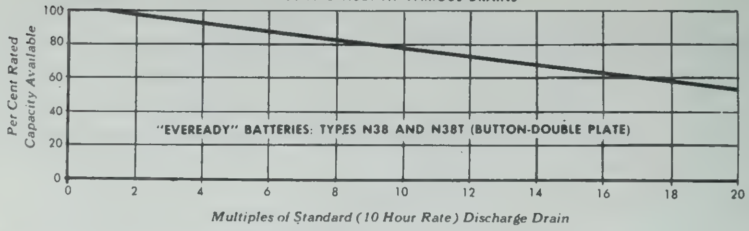


FIGURE 9: CAPACITY OF TYPES N45, N46 AND N52 AT VARIOUS DRAINS

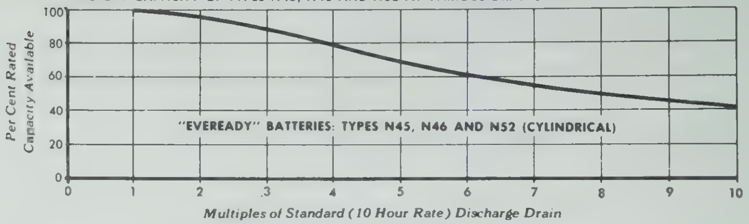


FIGURE 10: CAPACITY OF TYPE N56 AT VARIOUS DRAINS

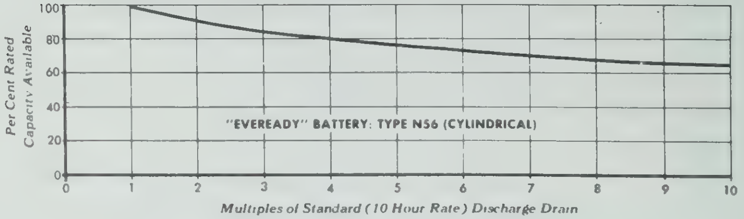


FIGURE 11: CAPACITY OF TYPES N73-N85 AT VARIOUS DRAINS

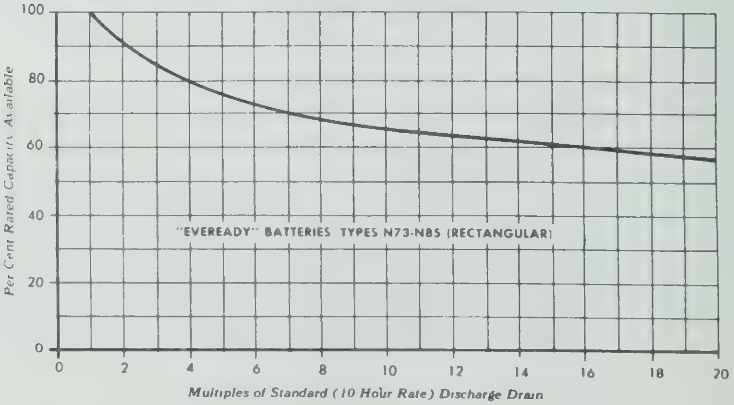
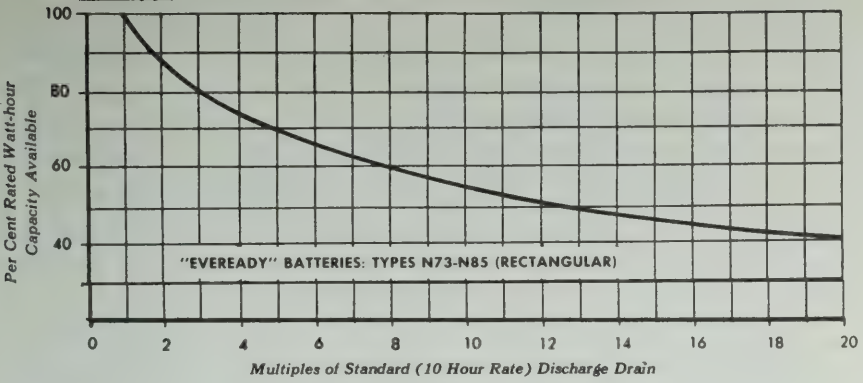


FIGURE 12: WATT-HOUR CAPACITY OF TYPES N73-N85 AT VARIOUS DRAINS



SAMPLE CALCULATION

Determine the watt-hours available from the N76 cell (a 6 ampere-hour cell – see Table 1) at a drain of 2.4 amperes.

$$\text{Standard Drain} = \frac{\text{Ampere-hour Capacity}}{10} = 0.6 \text{ ampere}$$

$$\frac{\text{Proposed Drain (amperes)}}{\text{Standard Drain (ampere)}} = \frac{2.4}{0.6} = 4 = \text{multiple of Standard Drain.}$$

Watt-hour capacity of N76 at standard discharge drain: 6 ampere-hours x 1.22 volts (average operating voltage at standard discharge drain) = 7.3 watt-hours = 100%.

From curve above, 74% of the watt-hour capacity is available at 2.4 amperes.

74% of 7.3 watt-hours = 5.4 watt-hours (capacity at a 2.4 ampere discharge drain.)

Paralleling of Cells

"Eveready" sealed nickel-cadmium cells should not be connected in parallel. Minor differences in internal resistance of the cells may result, after cycling, in extreme variations in their states of charge, leading to overcharge at excessive currents in some cells and polarity reversal in others.

Test Methods

It is difficult to determine accurately the condition of a nickel-cadmium battery. The only way to be certain is to put it through several discharge and charge cycles. If the voltage of a cell is low – for example, less than 1.0 volt – it may merely mean that the cell needs to be charged. If the open circuit voltage of a cell exceeds 1.40 volts it can generally be assumed that the cell is fully charged. In between these values the state of charge can not be determined accurately; there is no quick test which will indicate the ampere-hour capacity remaining.

Voltage Characteristics

During discharge, the average voltage of a sealed nickel-cadmium battery is approximately 1.2 volts per cell. At normal discharge rates the characteristic is very nearly flat until the cell approaches complete discharge. The battery provides most of its energy above 1.1 volts per cell. If the cell is discharged with currents exceeding the rated value, however, the voltage characteristic will have more of a slope, a lower end point voltage will be necessary, and the ampere-hour capacity per cycle will be reduced.

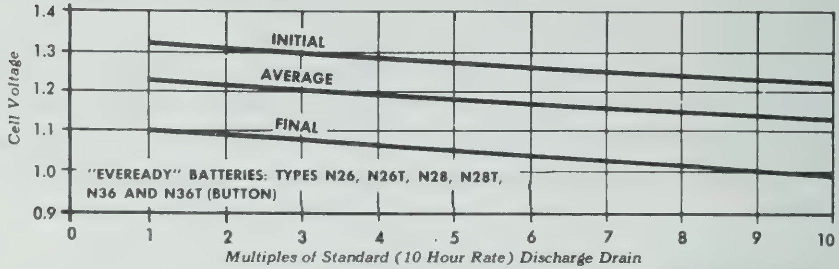
The initial discharge voltage, shown on the curves which follow, is defined as the cell voltage under load after 10% of the ampere-hour capacity has been removed from a fully charged cell. The final discharge voltage is the cell voltage after the rated ampere-hour capacity has been removed from a fully charged cell.

The curves presented on the following pages depict initial, average and final discharge voltages (Figures 13-19), and cell voltage during discharge (Figures 20-27). As the discharge current increases, the voltage values decrease.

The method used in the sample calculation shown under Figure 13 can also be employed when using Figures 14-19.

Discharge Voltage Characteristics of Sealed Nickel-Cadmium Cells

FIGURE 13: INITIAL, AVERAGE AND FINAL DISCHARGE VOLTAGES AT VARIOUS DRAINS FOR TYPES N26, N26T, N28, N28T, N36 AND N36T



SAMPLE CALCULATION

Determine the initial, average and final discharge voltages when the N28 cell (a 150 milliampere-hour cell — see Table 1) is discharged at a 30 ma. drain.

$$\text{Standard Drain} = \frac{\text{Milliampere-hour Capacity}}{10} = 15 \text{ ma.}$$

$$\frac{\text{Proposed Drain (ma.)}}{\text{Standard Drain (ma.)}} = \frac{30}{15} = 2 = \text{multiple of Standard Drain.}$$

From curve above, the voltage values are:

Initial voltage ....1.31 volts
Average voltage ....1.21 volts
Final voltage ....1.08 volts

FIGURE 14: INITIAL, AVERAGE AND FINAL DISCHARGE VOLTAGES AT VARIOUS DRAINS FOR TYPES N32 AND N32T

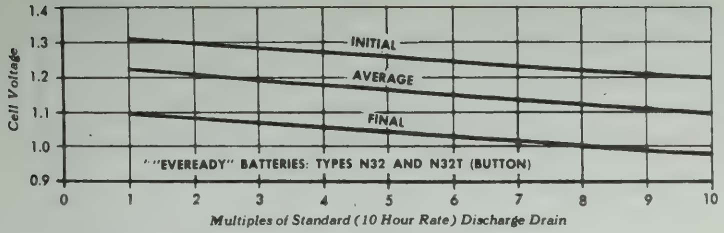


FIGURE 15: INITIAL, AVERAGE AND FINAL DISCHARGE VOLTAGES AT VARIOUS DRAINS FOR TYPES N33 AND N33T

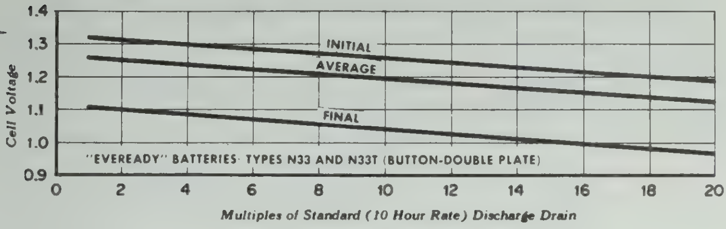


FIGURE 16: INITIAL, AVERAGE AND FINAL DISCHARGE VOLTAGES AT VARIOUS DRAINS FOR TYPES N38 AND N38T

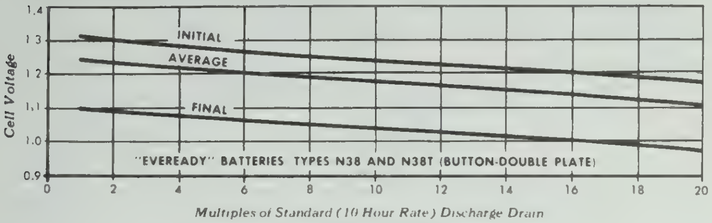


FIGURE 17: INITIAL, AVERAGE AND FINAL DISCHARGE VOLTAGES AT VARIOUS DRAINS FOR TYPES N45, N46 AND N52

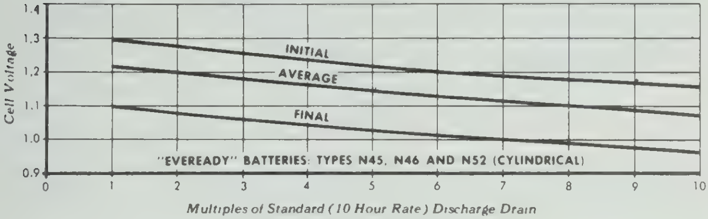


FIGURE 18: INITIAL, AVERAGE AND FINAL DISCHARGE VOLTAGES AT VARIOUS DRAINS FOR TYPE N56

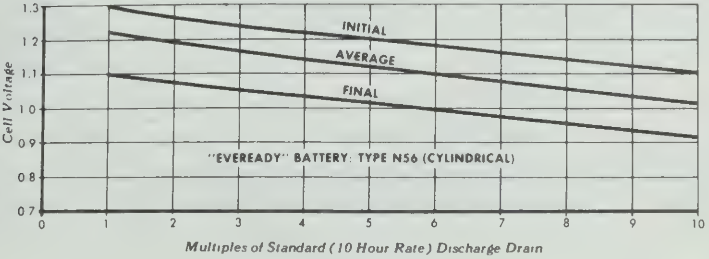


FIGURE 19: INITIAL, AVERAGE AND FINAL DISCHARGE VOLTAGES AT VARIOUS DRAINS FOR TYPES N73-N85

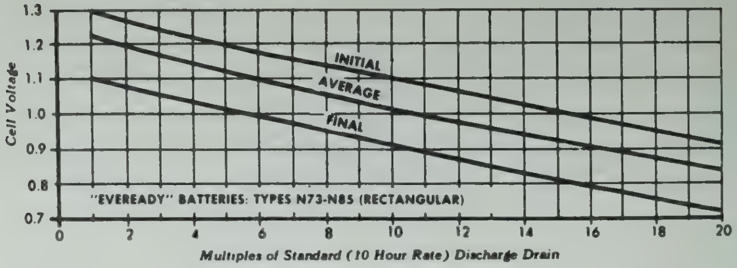


FIGURE 20: VOLTAGE OF TYPES N33 AND N33T DURING DISCHARGE AT ONE, TWO AND THREE TIMES THE STANDARD (10 HOUR) DISCHARGE CURRENT (I_{10})

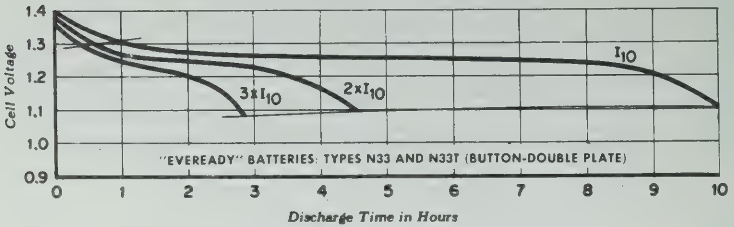


FIGURE 21: VOLTAGE OF TYPES N33 AND N33T DURING DISCHARGE AT FIVE AND TEN TIMES THE STANDARD (10 HOUR) DISCHARGE CURRENT (I_{10})

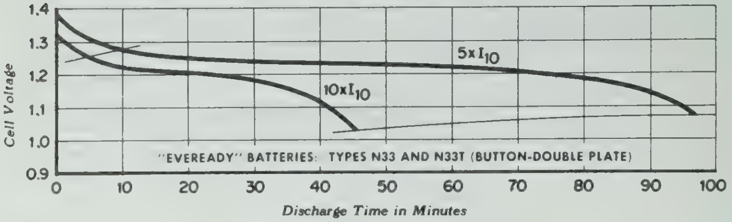


FIGURE 22: VOLTAGE OF TYPES N38 AND N38T DURING DISCHARGE AT ONE, TWO AND THREE TIMES THE STANDARD (10 HOUR) DISCHARGE CURRENT (I_{10})

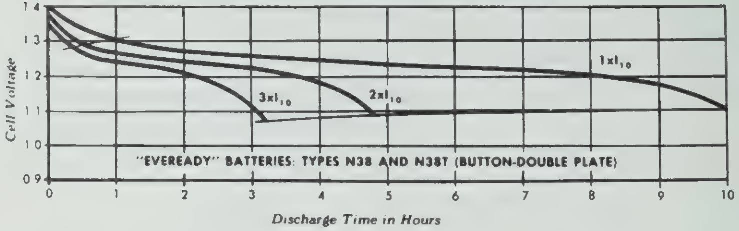


FIGURE 23: VOLTAGE OF TYPES N38 AND N38T DURING DISCHARGE AT FIVE AND TEN TIMES THE STANDARD (10 HOUR) DISCHARGE CURRENT (I_{10})

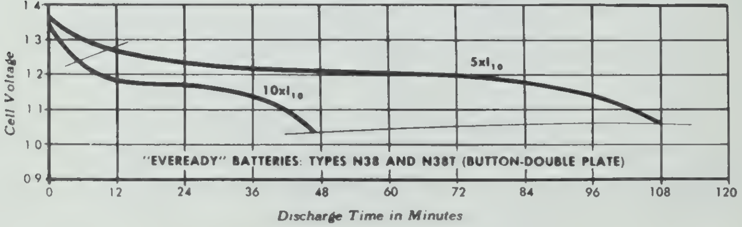


FIGURE 24: VOLTAGE OF TYPES N45, N46 AND N52 DURING DISCHARGE AT ONE, TWO AND THREE TIMES THE STANDARD (10 HOUR) DISCHARGE CURRENT (I_{10})

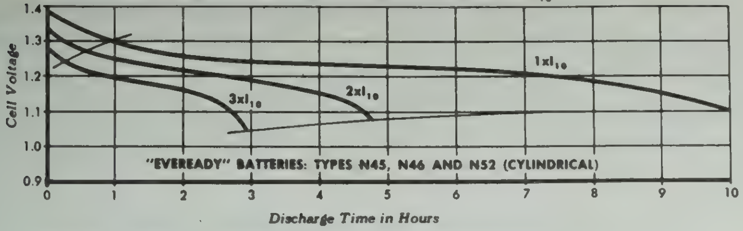


FIGURE 25: VOLTAGE OF TYPES N45, N46 AND N52 DURING DISCHARGE AT FIVE AND TEN TIMES THE STANDARD (10 HOUR) DISCHARGE CURRENT (I_{10})

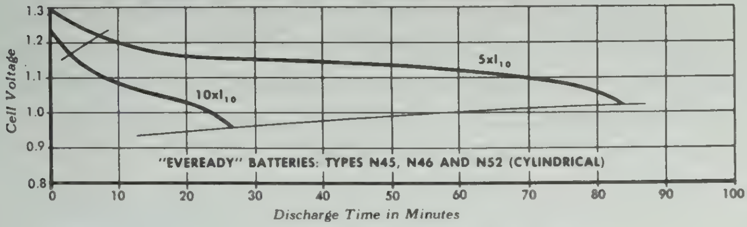


FIGURE 26: VOLTAGE OF TYPE N56 DURING DISCHARGE AT ONE, TWO AND THREE TIMES THE STANDARD (10 HOUR) DISCHARGE CURRENT (I_{10})

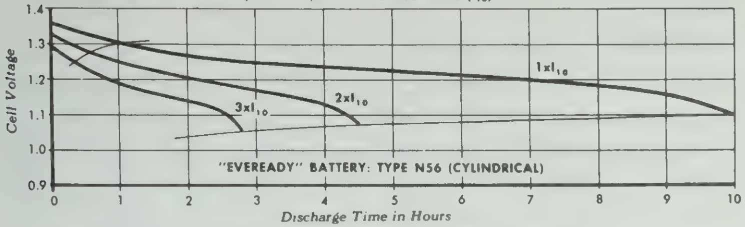
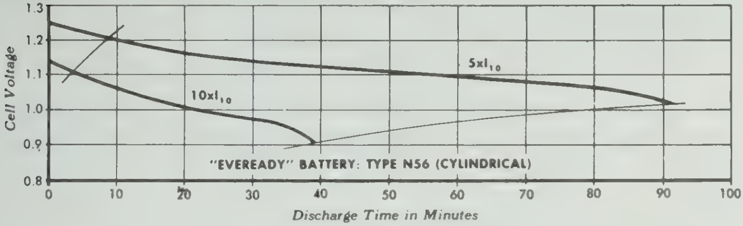


FIGURE 27: VOLTAGE OF TYPE N56 DURING DISCHARGE AT FIVE AND TEN TIMES THE STANDARD (10 HOUR) DISCHARGE CURRENT (I_{10})



Polarity Reversal

When cells are connected in series and then discharged completely, small differences in the ampere-hour capacity of the individual cells will cause one cell to reach complete discharge sooner than the remainder. The voltage of these other cells will cause current to continue to flow through the completely discharged cell. This will cause the cell to over-discharge and reversal of electrode polarity will occur.

When this happens, in an ordinary sealed nickel-cadmium cell, oxygen will be evolved at the cadmium electrode and hydrogen will be generated at the nickel electrode. There is no way of reacting these gases so pressure will build up until the cell ruptures. This condition is prevented in "Eveready" sealed nickel-cadmium cells and batteries by special construction features. These include the use of additional active materials, called "anti-polar mass", in the nickel electrode. It is then possible to prevent hydrogen formation and to react the oxygen formed during deep discharge by the same basic process used to prevent gassing on overcharge.

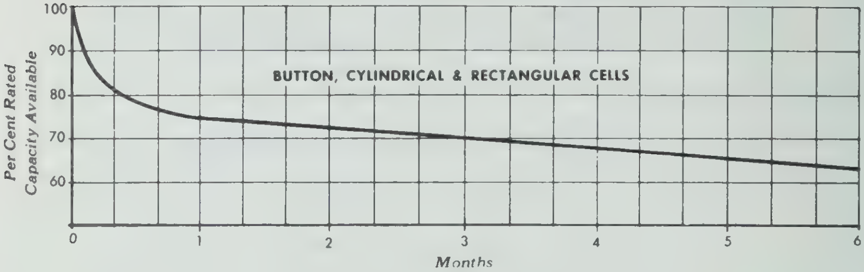
A cell is considered protected against reversal of polarity if, after discharge at the 10 hour rate down to 1.1 volts, it may receive an additional 5 hour discharge with the same current without being damaged or otherwise affected. This protection applies to all "Eveready" nickel-cadmium cells except No. N24, which, as previously noted, should not be stacked. Nos. N45 and N46 do not quite meet the above definition of reversal protection but still can be series-connected.

The maximum current for which sealed nickel-cadmium cells are protected against polarity reversal is the 10 hour rate discharge.

Self-Discharge

Typical self-discharge curves of "Eveready" nickel-cadmium cells are shown in Figure 28. The characteristic is shown as a decline in per cent of rated capacity available. Note that after the first month the capacity decreases only gradually with age. These rechargeable batteries have lower self-discharge rates than any other present secondary battery system. More important, the batteries are not harmed even if not used for long periods of time.

FIGURE 28: TYPICAL SELF-DISCHARGE CURVE OF SEALED NICKEL-CADMIUM CELLS IN DRY AIR



Temperature Characteristics

"Eveready" sealed nickel-cadmium cells experience a relatively small loss of capacity at operating temperatures ranging from – 20° C to + 45° C. Within this range the characteristic stable discharge voltage is maintained. Ranges of temperature applicable to operation of the cells are:

Charge: 0° C to + 45° C (+ 32° F to + 113° F)
Discharge: – 20° C to + 45° C (– 4° F to + 113° F)
Storage: – 40° C to + 60° C (– 40° F to + 140° F)

The batteries may be discharged at a maximum temperature of 160° F (71° C). This does not apply to charging or storage as high temperatures in both instances are detrimental to the battery.

The following curves, (Figures 29-34) present capacity and discharge voltages vs. temperature.

FIGURE 29: CAPACITY OF SEALED NICKEL-CADMIUM BUTTON CELLS ON 10 HOUR RATE DISCHARGE AT TEMPERATURES BETWEEN + 45 C AND – 20 C

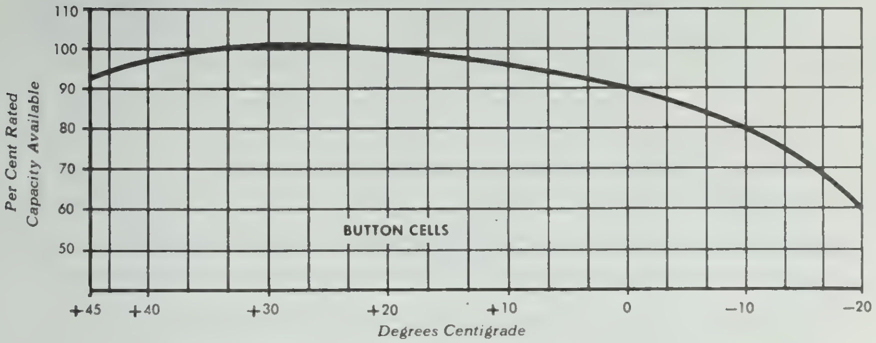


FIGURE 30: CAPACITY OF SEALED NICKEL-CADMIUM CYLINDRICAL CELLS ON 10 HOUR RATE DISCHARGE AT TEMPERATURES BETWEEN + 45°C AND – 20°C

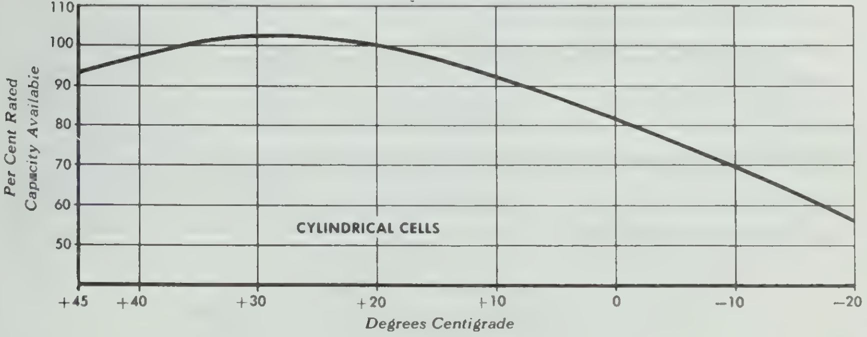


FIGURE 31: CAPACITY OF SEALED NICKEL-CADMIUM RECTANGULAR CELLS ON 10 AND 5 HOUR RATE DISCHARGE AT TEMPERATURES BETWEEN +45°C AND −20°C

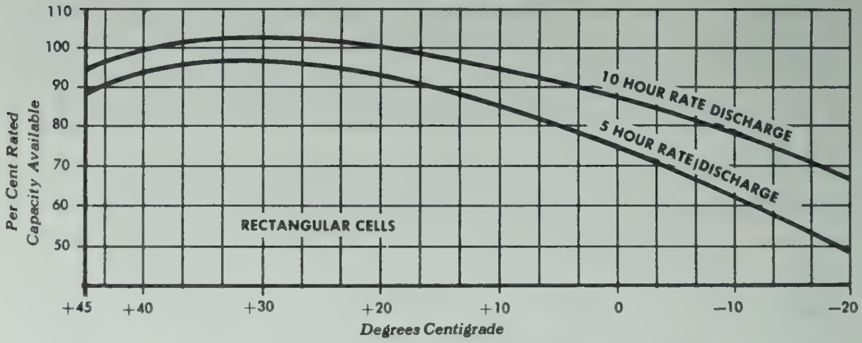


FIGURE 32: VOLTAGE VARIATION OF BUTTON CELLS WITH TEMPERATURE — 10 HOUR RATE DISCHARGE

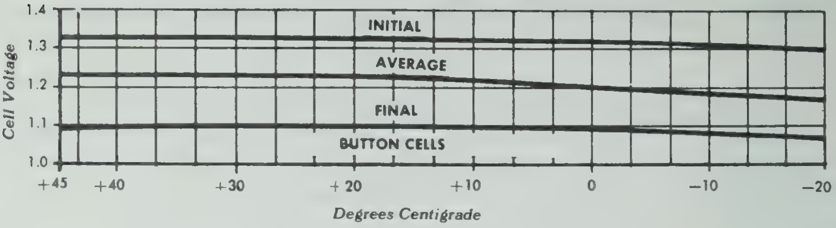


FIGURE 33: VOLTAGE VARIATION OF CYLINDRICAL CELLS WITH TEMPERATURE — 10 HOUR RATE DISCHARGE

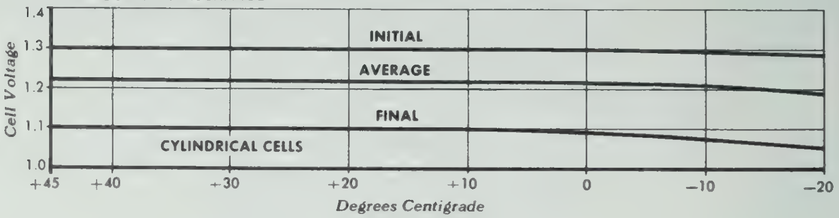
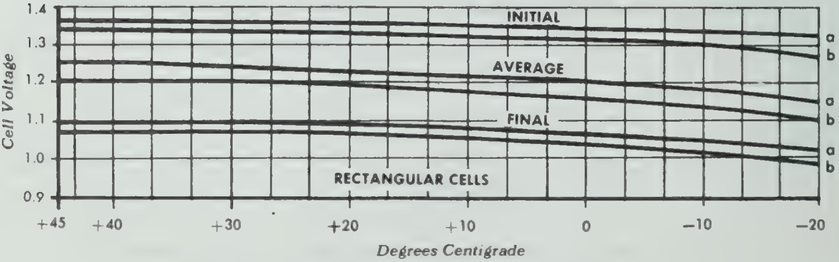


FIGURE 34: VOLTAGE VARIATION OF RECTANGULAR CELLS WITH TEMPERATURE 10 AND 5 HOUR RATE DISCHARGE



Characteristics marked "a" apply to discharge at 10 Hour Rate.
Characteristics marked "b" apply to discharge at 5 Hour Rate.

Storage

During storage sealed nickel-cadmium cells will lose some of their charge. At storage temperatures of 100° F to 120° F, self-discharge will increase considerably, as compared to 70° F. This is a result of the chemical reduction of the nickel electrode. Prolonged storage at high temperatures can result in cells being irreparably damaged. Storage temperatures can have a marked effect on expected life; for best results it is recommended that batteries be stored at 70° F or lower. Cold storage offers a definite advantage. If cells have been stored for a long period, regardless of the temperature of storage, they should not immediately be charged but should first be fully discharged and then charged with a current not exceeding the 20 hour rate. Discharging the cells first breaks down oxide that forms on the cadmium electrode. This is necessary since during the operation of the cell oxygen must react with metallic cadmium.

Impedance

Sealed nickel-cadmium cells have a high effective capacitance. Their impedance is so low that cells which, in effect, are being continuously overcharged, can be used to replace very large capacitors for filtering the ripple out of DC power supplies. In the filter application, of course, current flow through the cell must be kept in the normal extended overcharge range thus limiting voltage across the cell to 1.45 – 1.50 volts.

Cell impedance is dependent upon frequency and state of charge of the cell. It is lower for a charged cell than it is for a discharged cell.

Table 3

STANDARD VALUES OF IMPEDANCE FOR CYLINDRICAL CELLS

"EVEREADY" BATTERY NUMBER	FREQUENCY — CYCLES PER SECOND			
	50	100	1000	10,000
N45 & N46	70 milliohms	65 milliohms	52 milliohms	46 milliohms
N52	62 milliohms	60 milliohms	53 milliohms	50 milliohms

Note: For partially discharged cells, these impedance values should be increased by approximately 20%. For fully discharged cells, they should be increased by at least 4 times.

Cycle Life

Under conditions of very light or casual service, the expected life of the cell is several years. Neither cycle life nor eventual cause of failure can be given because of the obvious difficulties in obtaining such information.

With normal service and discharge of rated capacity, the number of discharge-charge cycles is, conservatively, in excess of 100 cycles for the button and cylindrical cells and in excess of 400 cycles for the rectangular cells. Cycle life is based on an endpoint of 80% of the rated ampere-hour capacity, with a discharge and charge current equivalent to the 10 hour rate and with discharge carried to the normal 10 hour end voltage on every cycle. If the discharge current is increased from the 10 hour rate the cycle life is reduced, but on the other hand if discharge current is reduced or if discharges are terminated before complete capacity removal, cycle life can be expected to improve.

Charging

The 10 hour rate should not be exceeded in constant current charging. Fourteen hours charging at this rate will fully charge the cell. Constant voltage charging, which is also acceptable, results in a higher initial charging rate. At the start of charge the current may greatly exceed the 10 hour rate, but the charging circuit must be designed so that the 10 hour current (or less) flows toward the end of charge.

The battery can be trickle charged or floated. For maximum performance in situations of continuous overcharge with occasional interruptions the current should not exceed the 30 hour rate. The trickle charging current required to keep the battery constantly in a fully charged condition should not exceed the 50 hour rate.

These cells will also stand extended overcharge at rates considerably higher than those recommended for floating. Although charging at the maximum rate (10 hours) is normally expected to be finished in 14 hours, cells will not be damaged by occasional charging at this rate even for several weeks. Continuous overcharging at higher than necessary rates accelerates general degradation of the cell but complete or sudden destruction will not result unless the 10 hour rate is exceeded.

Cells must not be charged at rates exceeding the 10 hour rate or oxygen may be evolved at the nickel electrode faster than it can be reacted at the cadmium electrode, with the result that sufficient pressure will build up to cause cell rupture.

Extended overcharging at high temperatures is very detrimental to the cell.

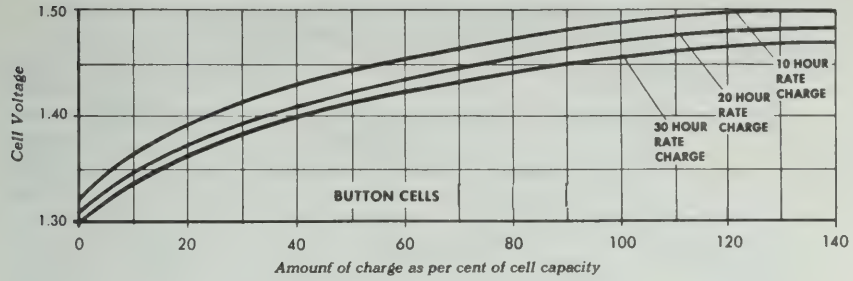
"Eveready" sealed nickel-cadmium cells are shipped partially charged.

The following curves (Figures 35-40), show voltage vs. charging current and charging current vs. charging time.

The method used in the sample calculation shown under Figure 35 can also be employed when using Figures 36-38.

Constant Current Charging

FIGURE 35: VOLTAGE OF BUTTON CELLS (PREVIOUSLY DISCHARGED TO 1.10 VOLTS) DURING CHARGING AT THE 10, 20 AND 30 HOUR RATES, RELATED TO AMOUNT OF CHARGE RECEIVED



SAMPLE CALCULATION

Assume the N28 cell (150 milliampere-hour capacity — see Table 1) is charged for 6 hours with a current of 5 ma., which is equal to the 30 hour rate charge. The amount of charge after 6 hours = 6 x 5 ma. = 30 milliampere-hours, corresponding to 20% of the cell capacity. The cell voltage at this point is 1.37 volts.

FIGURE 36: VOLTAGE OF TYPES N38 AND N38T (PREVIOUSLY DISCHARGED TO 1.10 VOLTS) DURING CHARGING AT THE 10 AND 20 HOUR RATES, RELATED TO AMOUNT OF CHARGE RECEIVED

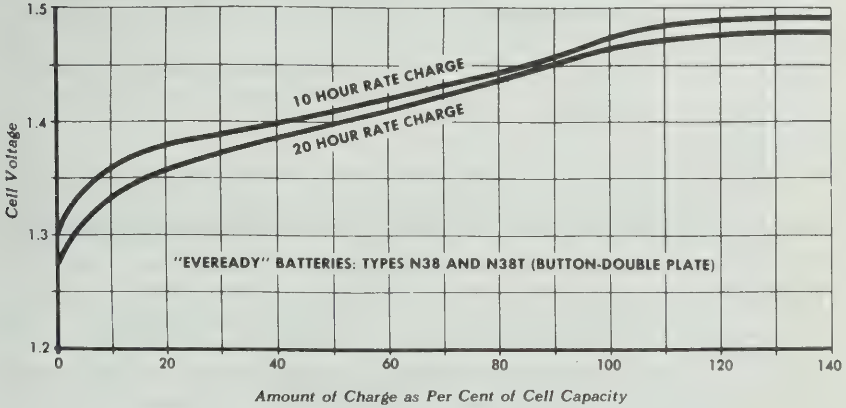


FIGURE 37: VOLTAGE OF CYLINDRICAL CELLS (PREVIOUSLY DISCHARGED TO 1.10 VOLTS) DURING CHARGING AT THE 10, 20 AND 30 HOUR RATES, RELATED TO AMOUNT OF CHARGE RECEIVED

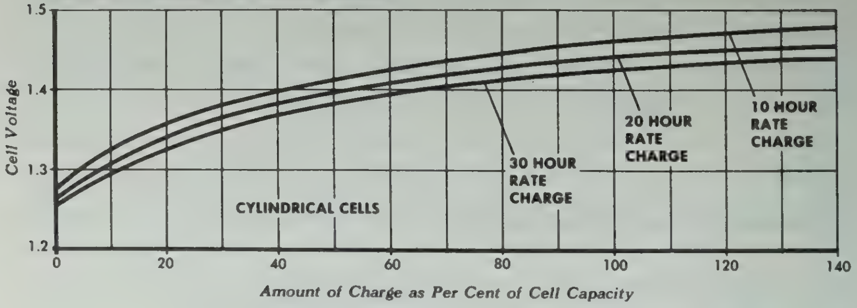
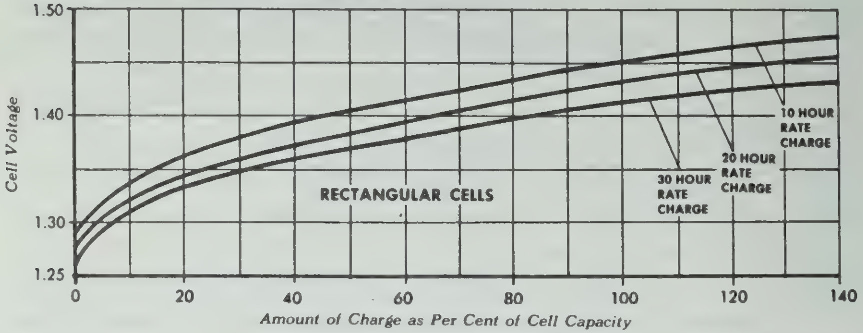
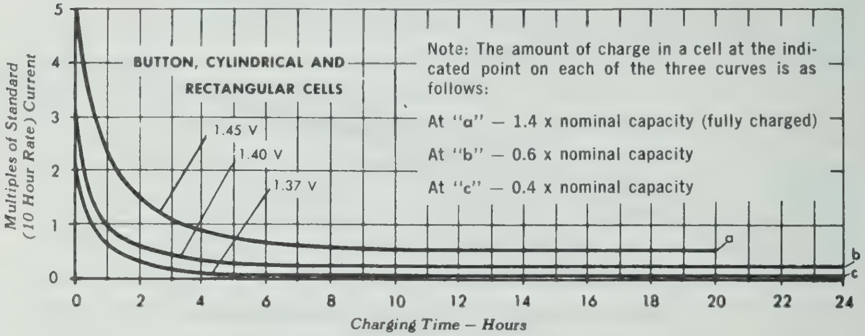


FIGURE 38: VOLTAGE OF RECTANGULAR CELLS (PREVIOUSLY DISCHARGED TO 1.10 VOLTS) DURING CHARGING AT THE 10, 20 AND 30 HOUR RATES, RELATED TO AMOUNT OF CHARGE RECEIVED



Constant Voltage Charging

FIGURE 39: CURRENT FLOW DURING CHARGING, AT CONSTANT VOLTAGES OF 1.3 V, 1.40 V AND 1.45 V., OF A SEALED NICKEL-CADMIUM CELL PREVIOUSLY DISCHARGED TO 1.10 VOLTS AT THE 10 HOUR RATE



Note: The amount of charge in a cell at the indicated point on each of the three curves is as follows:

At "a" — 1.4 x nominal capacity (fully charged)

At "b" — 0.6 x nominal capacity

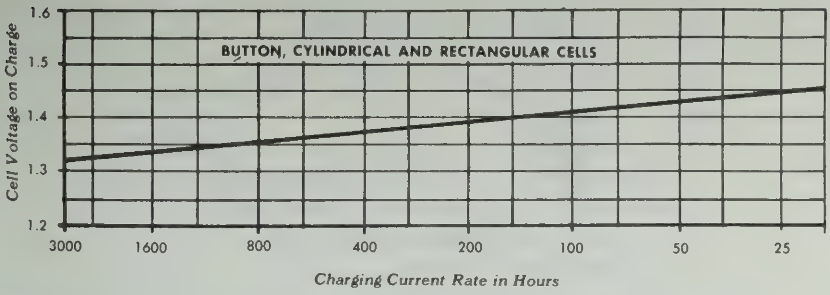
At "c" — 0.4 x nominal capacity

EXAMPLE:

Assume an N28 cell (150 milliampere-hour capacity — see Table 1) is charged at 1.45 volts constant voltage.

After 10 hours the charging current is 0.5 times standard (10 hour rate) current = 0.5 x 15 ma. = 7.5 ma.

FIGURE 40: CELL VOLTAGE DURING FURTHER CHARGING OF FULLY CHARGED BUTTON, CYLINDRICAL OR RECTANGULAR CELL, IN RELATION TO CHARGING CURRENT



EXAMPLE: Upon further charging of a fully charged N28 cell at the 300 hour rate, equal to 0.5 ma., the cell voltage is 1.38 volts.

Trickle Charging

To compensate for self-discharge of a fully charged cell a trickle charge current at the 3000 hour rate is required to keep the cell in near fully charged condition. The cell voltage with this charging current establishes itself at 1.32 volts (see Figure 40).

Floating Charge

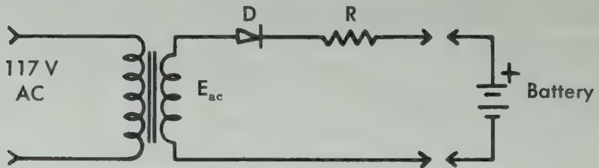
The floating current should be adjusted to replace 1.4 times the amperage withdrawn from a cell. If the voltage is to be adjusted instead, it, too, should be regulated according to the daily capacity withdrawal. For example, if about 1/10 of the cell capacity is withdrawn from a fully charged cell in a 24 hour period, the terminal voltage while the cell is on trickle charge should be maintained at 1.40 volts. If the full capacity of the cell is withdrawn in a 24 hour period, this voltage should be set at 1.45 volts. (See "Note" on Figure 39.)

Charging Circuits

Charging equipment for sealed nickel-cadmium cells is simple and can be incorporated as an integral part of the end use device. Half-wave or full-wave rectification is satisfactory, and no filtering is required. Half-wave rectifiers are generally used for low current applications and full-wave rectifiers for the higher charging currents associated with high-capacity batteries. The following are some typical charging circuits.

Charging Circuits for Small Nickel-Cadmium Batteries

FIGURE 41: TRANSFORMER AND HALF-WAVE RECTIFIER



D – SINGLE PLATE (26V AC) SELENIUM RECTIFIER

R – CURRENT LIMITING RESISTOR

The simple charging circuit above consists of a voltage step down transformer, single plate selenium half-wave rectifier, and a series current limiting resistor. It can be designed for any sizes or combinations of nickel-cadmium cells. No damage will result if the 117 volt supply is turned on while the battery is disconnected. Electric shock hazards are minimized by the low voltage transformer which isolates the battery from the power line.

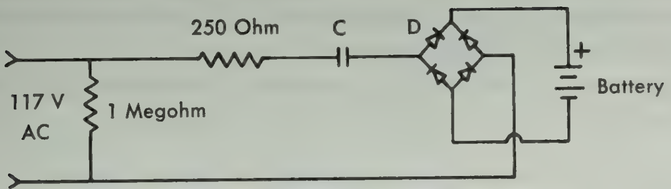
TABLE 4

CIRCUIT VALUES SUITABLE FOR OVERNIGHT (14 HOUR) CHARGING USING THE CIRCUIT ILLUSTRATED IN FIGURE 41

BATTERY TYPE	NUMBER IN SERIES	E_{ac}	RECTIFIER PLATE SIZE	R	NOMINAL CHARGE CURRENT
N24	1 2	6.3V 6.3V	0.475″ sq. 0.475″ sq.	340 ohm 200 ohm	5 ma. 5 ma.
N26 or N26T	1 2	6.3V 6.3V	0.475″ sq. 0.475″ sq.	150 ohm 90 ohm	10 ma. 10 ma.
N28 or N28T	1 2	6.3V 6.3V	0.475″ sq. 0.475″ sq.	100 ohm 56 ohm	15 ma. 15 ma.
N32 or N32T	1 2	6.3V 6.3V	0.475″ sq. 0.475″ sq.	70 ohm 40 ohm	22.5 ma. 22.5 ma.
N36, N36T, N38, N38T, N45 or N46	1 2	6.3V 6.3V	1.0″ sq. 1.0″ sq.	40 ohm 22 ohm	45 ma. 45 ma.
N67	1	10.0V	1.0″ sq.	14 ohm	90 ma.
N70	1	10.0V	1.25″ sq.	9 ohm	150 ma.

NOTE: The suggested values for R should be checked by measuring the DC charging current with the actual transformer-rectifier combination which will be used in the charger.

FIGURE 42: TRANSFORMER-LESS FULL-WAVE RECTIFIER



D — SELENIUM FULL-WAVE BRIDGE RECTIFIER
0.475" SQ. PLATES: MAX. AC — 26V RMS
MAX. DC — 0.05 AMPERE

C — PAPER CAPACITOR
600V DC RATING

The circuit above is not suitable for charging currents over 25 milliamperes because of the large value required for the capacitor.

CAUTION:

The battery must remain connected to the rectifier at all times when AC power is supplied to the circuit to prevent burn-out of the bridge rectifier. All parts of the circuit, including the battery and battery connections, must be insulated to eliminate the hazard of electric shocks.

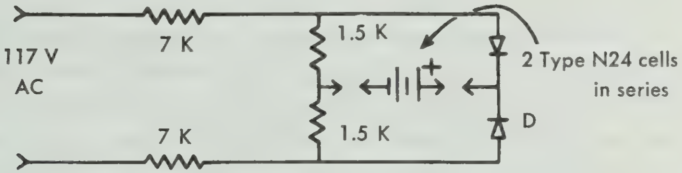
In general, this type of circuit should be used only when it is built into the end use device along with non-removable batteries.

TABLE 5

VALUES FOR CAPACITOR "C" IN FIGURE 42

BATTERY TYPE	NUMBER IN SERIES	C	NOMINAL CHARGE CURRENT
N24	1 to 5	0.12 mfd.	5 ma.
N26 or N26T	1 to 5	0.25 mfd.	10 ma.
N28 or N28T	1 to 5	0.40 mfd.	15 ma.
N32 or N32T	1 to 5	0.60 mfd.	22.5 ma.

FIGURE 43: VOLTAGE DIVIDER FULL-WAVE RECTIFIER



D — SELENIUM CENTER TAP RECTIFIER
0.282" DIAMETER PLATES: MAX. AC — 26V RMS
MAX. DC — 0.01 AMPERE

The circuit values shown above will provide a charging current of approximately 4.5 milliamperes for two type N24 cells connected in series. This charger will not be damaged if it is connected to the AC power line with the batteries removed.

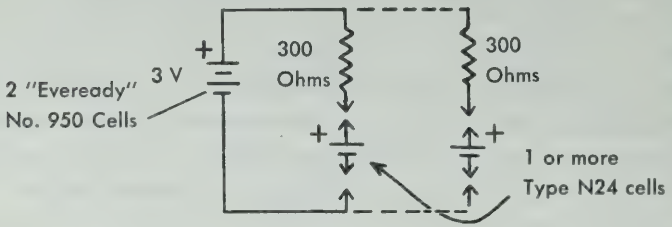
By changing the resistor values, single cells or three to five cells in series could be charged. This circuit would also be suitable for charging type N26 cells at 10 milliamperes.

Higher currents requiring high wattage resistors would not be practicable because of the excessive heat that would be produced.

CAUTION:

All parts of the circuit, including the battery and battery connections, must be insulated to eliminate shock hazards.

FIGURE 44: CHARGING FROM PRIMARY BATTERIES



Small button cells, such as those used in hearing aids, may be readily charged from flashlight cells, lantern batteries or six inch cells. Figure 44 is shown by way of example. This circuit will charge one or more type N24 cells in parallel at approximately 5 milliamperes each.

General Design Notes for Selenium Rectifier Battery Charging Circuits

Half-wave rectifiers are generally used only for low current applications. The efficiency is low, and special transformer designs are required at higher currents due to the core saturating effect of the DC current component in the secondary winding.

Full-wave rectifiers may be the center-tap or bridge types. The bridge circuit is popular because of its flexibility, simplicity and use of an economical transformer design. However, the center-tap circuit may be preferred for voltages low enough to require only one selenium cell per rectifier arm. In this case the less expensive rectifier offsets the more costly center tapped transformer.

When using the design formulas for nickel-cadmium battery chargers, the AC voltage (E_{ac}) should be at least twice the voltage of the battery to prevent the occurrence of large changes in charging current with line voltage variations. Fully charged nickel-cadmium cells have an "on charge" voltage of about 1.5 volts and this value is used to determine the DC voltage (E_{dc}). The formulas and rectifier data are approximate, but are sufficiently accurate for practical design purposes. Final designs should be checked by measuring the DC charging currents and adjusting the values of R as may be required.

SYMBOLS

E_{dc} = Battery voltage = 1.5 times number of series cells.
I_{dc} = Average charging current in amperes.
E_{ac} = Alternating rms input voltage per secondary winding.
n = Number of selenium cells in series per arm of rectifier.
$\triangle V$ = rms voltage drop per selenium cell at I_{dc} (See Figure 45 and Table 6)
R = Series resistance.

FIGURE 45: TYPICAL DYNAMIC FORWARD VOLTAGE DROP CURVES FOR SELENIUM RECTIFIER CELLS

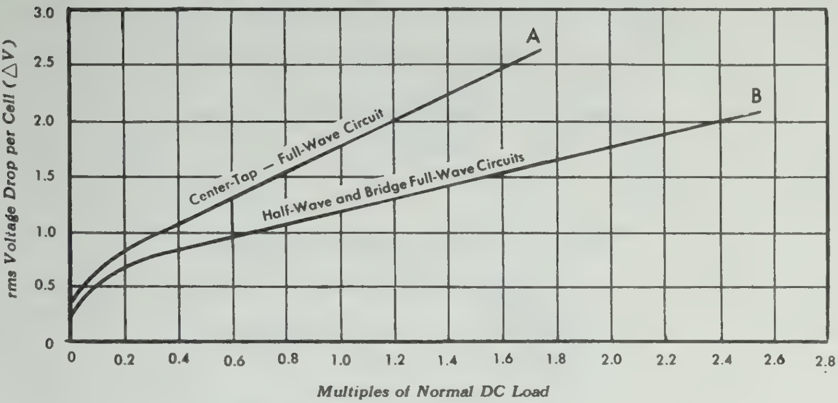
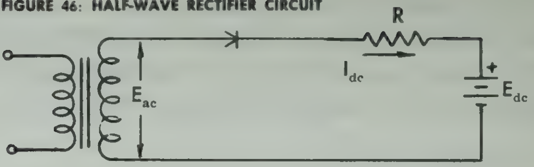


TABLE 6

SELENIUM CELL RATINGS (For Less Than 8 Cells Per Stack)

CELL SIZE	NORMAL DC LOAD—AMPERES	
	HALF-WAVE CIRCUIT	FULL-WAVE CIRCUIT
0.282" Dia.	0.005	0.010
0.475" Sq.	0.025	0.050
0.67" Sq.	0.065	0.13
1.0" Sq.	0.112	0.225
1.25" Sq.	0.23	0.45
1.5" Sq.	0.45	0.90
2.0" Sq.	0.75	1.5
3.0" Sq.	1.5	3.0
4.0" Sq.	3.0	6.0
MAXIMUM VOLTAGE PER CELL = 26 VOLTS rms		

FIGURE 46: HALF-WAVE RECTIFIER CIRCUIT



$$E_{ac} = E_{dc} + n\triangle V + 2.31\, I_{dc}\, R$$

SAMPLE CALCULATION

Determine the series resistor "R" required to charge two "Eveready" No. N73 cells in series, at the 14 hour rate of 0.2 ampere, with a 6.0 volt AC input.

$E_{dc} = 1.5\text{x}2 = 3.0\text{V}$ $\quad I_{dc} = 0.2$ ampere
$E_{ac} = 6.0\text{V rms}$ $\quad n = 1$

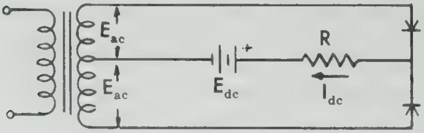
Rectifier required – 1.25" Sq. with normal DC load rating of 0.23 ampere (see Table 6)

$$\text{Multiple of normal DC load} = \frac{0.2}{0.23} = 0.87$$

$\triangle V = 1.1\text{V rms}$ (see Figure 45, Curve B)

$$\text{Then } R = \frac{E_{ac} - E_{dc} - n\triangle V}{2.3\, I_{dc}} = 4.1 \text{ ohms}$$

FIGURE 47: CENTER-TAP FULL-WAVE RECTIFIER CIRCUIT



$$E_{ac} = 0.85\, E_{dc} + n\triangle V + 1.15\, I_{dc}\, R$$

SAMPLE CALCULATION

Determine the series resistor "R" required to charge one "Eveready" No. N85 cell at the 14 hour rate of 2.3 amperes, with a 5.0 volt AC input.

$E_{dc} = 1.5\text{V}$ $\quad I_{dc} = 2.3$ amperes
$E_{ac} = 5.0\text{V rms}$ $\quad n = 1$

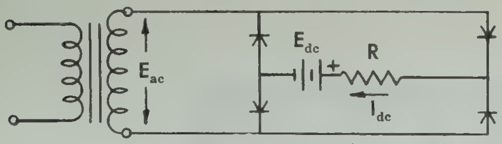
Rectifier required – 3.0" Sq. with normal DC load rating of 3.0 amperes (see Table 6)

$$\text{Multiple of normal DC load} = \frac{2.3}{3.0} = 0.77$$

$\triangle V = 1.5\text{ V rms}$ (see Figure 45, Curve A)

$$\text{Then } R = \frac{E_{ac} - 0.85\, E_{dc} - n\triangle V}{1.15\, I_{dc}} = 0.84 \text{ ohm}$$

FIGURE 48: BRIDGE FULL-WAVE RECTIFIER CIRCUIT



$$E_{ac} = 0.85\,E_{dc} + 2\,n\triangle V + 1.15\,I_{dc}\,R$$

SAMPLE CALCULATION

Determine the series resistor "R" required to charge one "Eveready" No. N81 cell at the 14 hour rate of 1.5 amperes, with a 6.0 volt AC input.

$E_{dc} = 1.5\text{V}$ $\quad$ $I_{dc} = 1.5$ amperes

$E_{ac} = 6.0\text{V rms}$ $\quad$ $n = 1$

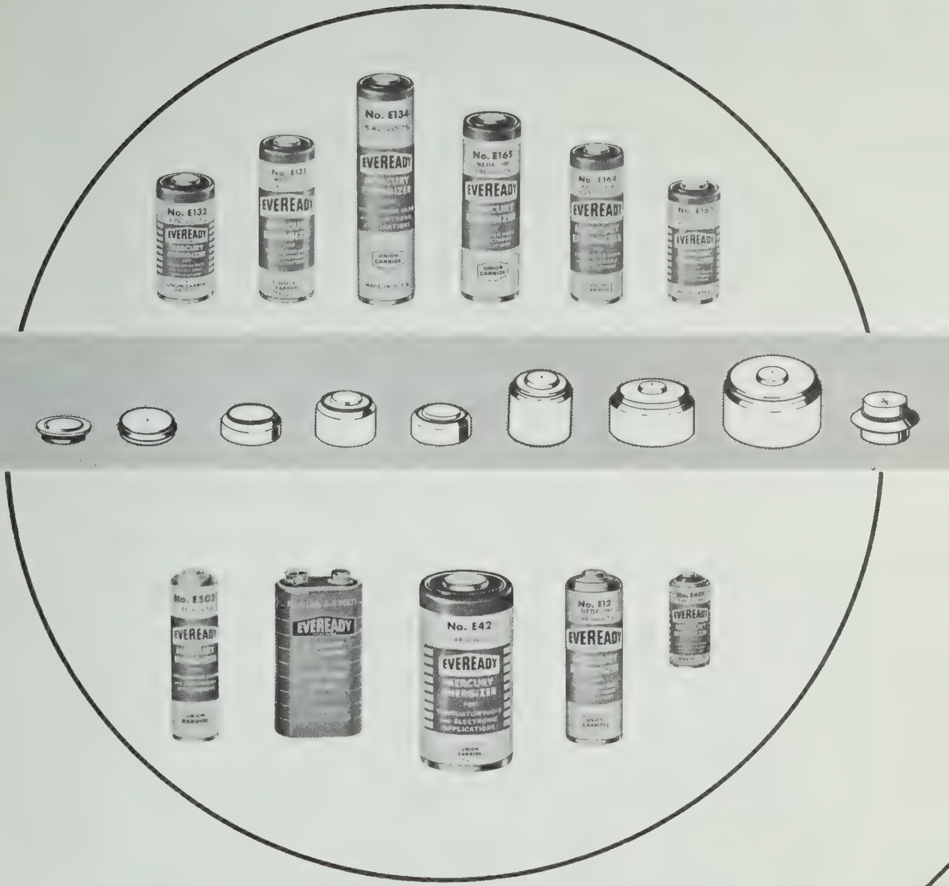
Rectifier required – 2.0″ Sq. with normal DC load rating of 1.5 amperes (see Table 6)

$$\text{Multiple of normal DC load} = \frac{1.5}{1.5} = 1.0$$

$\triangle V = 1.2\text{V rms}$ (see Figure 45, Curve B)

$$\text{Then } R = \frac{E_{ac} - 0.85\,E_{dc} - 2n\,\triangle V}{1.15\,I_{dc}} = 1.35 \text{ ohms}$$

MERCURY BATTERIES



Mercury Batteries

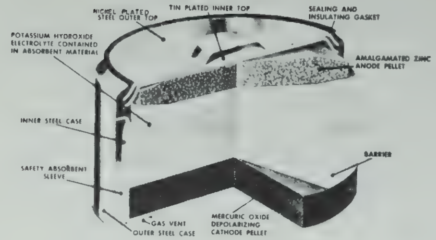
The mercury battery consists essentially of a depolarizing mercuric oxide cathode, an anode of pure amalgamated zinc and a concentrated aqueous electrolyte of potassium hydroxide saturated with zincate. The cathode and anode are pressed shaped structures which are assembled into a sealed steel container.

Utilization of active materials is 80 to 90% – a higher efficiency than hitherto attained in a primary cell. 90% efficiency is obtained at a current drain of 0.1 ampere per square inch of depolarizer surface. (0.2 ampere-hour per gram of depolarizer). Therefore, recommended drains are given for each cell type.

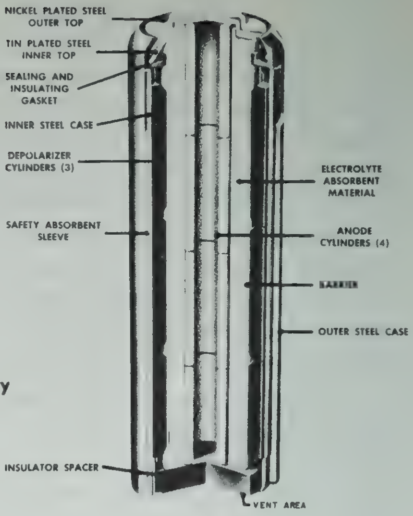
The fundamental components of the mercury cell are a pressed mercuric oxide cathode (in sleeve or pellet form) and pressed cylinders, or pellets, of powdered zinc with steel enclosures. These provide precise mechanical assemblies having maximum dimensional stability and marked improvements in performance over dry batteries of the Leclanché (carbon-zinc) type.

Characteristics and features of the mercury electro-chemical mechanical system in the present state of the art include:

- High capacity-to-volume ratio results in several times the capacity of other primary cells in the same volume, or proportionally reduced volume for the same capacity.
- Higher sustained voltage under load.
- Relatively constant ampere-hour capacity.
- Low and substantially constant internal impedance.
- No recuperation required; therefore, the same capacity is obtained in either intermittent or continuous usage.
- Excellent shelf life.
- Good high temperature characteristics.
- Good resistance to shock, vibration and acceleration.
- Electrically welded intercell connections.
- Single or double steel case encapsulation.
- Chemically balanced – all zinc is converted at end of life.
- Automatic vent.
- Less frequent replacement.


NICKEL PLATED STEEL OUTER TOP
TIN PLATED INNER TOP
SEALING AND INSULATING GASKET
POTASSIUM HYDROXIDE ELECTROLYTE CONTAINED IN ABSORBENT MATERIAL
AMALGAMATED ZINC ANODE PELLET
INNER STEEL CASE
BARRIER
SAFETY ABSORBENT SLEEVE
GAS VENT
OUTER STEEL CASE
MERCURIC OXIDE DEPOLARIZING CATHODE PELLET

Flat type pressed powder anode cell or "A" battery


NICKEL PLATED STEEL OUTER TOP
TIN PLATED STEEL INNER TOP
SEALING AND INSULATING GASKET
INNER STEEL CASE
DEPOLARIZER CYLINDERS (3)
ELECTROLYTE ABSORBENT MATERIAL
SAFETY ABSORBENT SLEEVE
ANODE CYLINDERS (4)
BARRIER
OUTER STEEL CASE
INSULATOR SPACER
VENT AREA

Cylindrical type pressed powder anode cell or "A" battery

MECHANICAL CONSTRUCTION

Cells are currently produced in two different designs using either flat or cylindrical types of pressed powder electrodes. Electro-chemically both cells are the same, differing only in case design and internal electrode arrangements.

1. Depolarizing cathodes of mercuric oxide, to which a small percentage of graphite is added, are shaped as illustrated above, and either consolidated to the cell case (for flat electrode types), or pressed into the cases of the cylindrical types.

2. Anodes are formed of amalgamated zinc powder of high purity, pressed into either flat or cylindrical shapes.

3. A permeable barrier of specially selected material prevents migration of any solid particles in the cell, thereby contributing effectively to long shelf and service life.

4. Insulating and sealing gaskets are molded of polyethylene or neoprene, depending on the application for which the cell or battery will be used.

5. Inner cell tops are plated with materials which provide an internal surface to which zinc will form a zinc amalgam bond.

6. Cell cases and outer tops of nickel-plated steel are used to resist corrosion, and to provide greatest passivity to internal cell materials.

7. An outer, nickel-plated, steel jacket is generally used for single cell "A" battery types. This outer jacket is a necessary component for the "self-venting construction" which provides a means of releasing excessive gas in the cell. Venting occurs if operating abnormalities, such as reverse currents or short circuits, produce excessive gas in the cell.

At moderately high pressures, the cell top is displaced upwards against the external crimped edge of the outer jacket, tightening that portion of the seal and relieving the portion between the top and the inner steel cell case. Venting will then occur in the space between the internal cell container and the outer steel jacket. Should any cell electrolyte be carried into this space, it will be retained by the safety absorbent ring. Corrosive materials, therefore, are not carried with the escaping gas through the vent hole at the bottom of the outer steel jacket. After venting excessive gas and reducing the internal pressure, the cell stabilizes and reseats the top seal, continuing normal operation in the circuit.

It should be noted that the polarity of individual cells is reversed from that of Leclanché types.

ELECTRICAL CHARACTERISTICS

Basic cells are available with two formulations designed for different field usage. In general, types having numbers not followed by the letter "E" are recommended for use in those applications where higher than normal temperatures may be encountered, and also where the cells are to be used as voltage reference sources. For example, type E1 rather than E1E would be intended for higher temperature and voltage reference applications.

CONSTANT POTENTIAL

Mercury batteries have been widely used as secondary standards of voltage because of the higher order of voltage maintenance and ability to withstand mechanical and electrical abuses. For use as reference sources in regulated power supplies, radiation detection meters, portable potentiometers, electronic computers, voltage recorders and similar equipment, desirable features are:

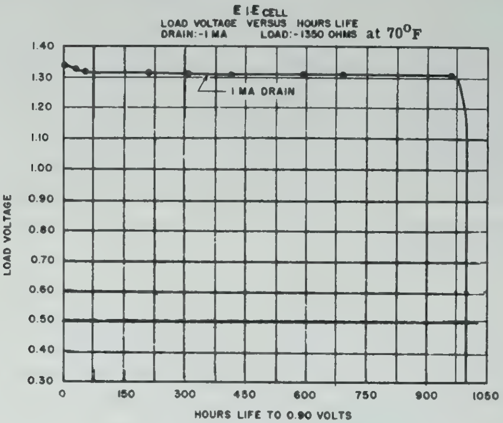
1. Voltage Stability vs. Time – Over long periods of time, regulation within 0.5% is maintained; for shorter periods, regulation of 0.1% may be realized.

2. Short-Circuit Currents – Momentary short circuits will cause no permanent damage with almost complete recovery of full open circuit EMF within minutes.

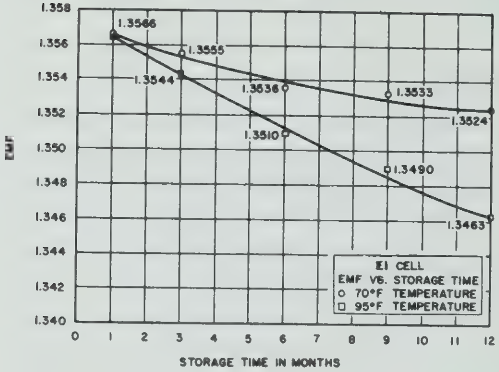
3. Heavy Load Currents – Depending on the type of cell used, high drains without damage can be obtained. Recovery to full open circuit EMF is rapid.

4. Reverse Currents – While reverse currents of appreciable magnitude or duration should be avoided, battery characteristics of the self venting types are not adversely affected where relatively light reverse currents are involved.

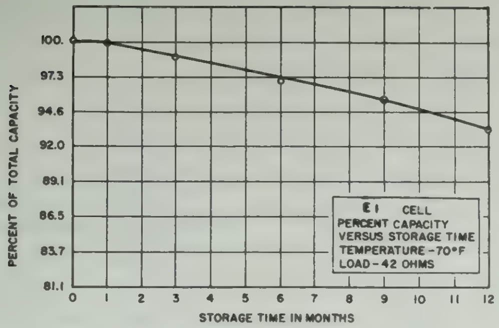
MERCURY CELL LOAD VOLTAGE VS. TIME AT CONSTANT LOAD



MERCURY CELL EMF VS. STORAGE TIME



CAPACITY VS. STORAGE TIME



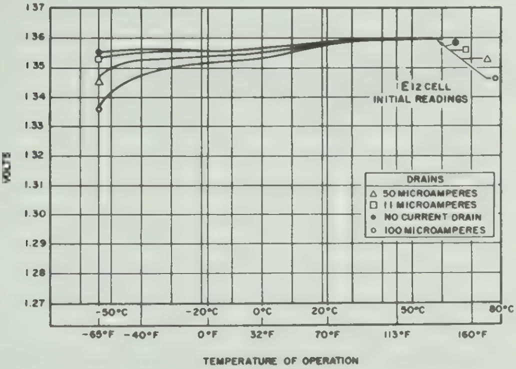
(Mean data taken at end of each period.)

WIDE TEMPERATURE RANGE

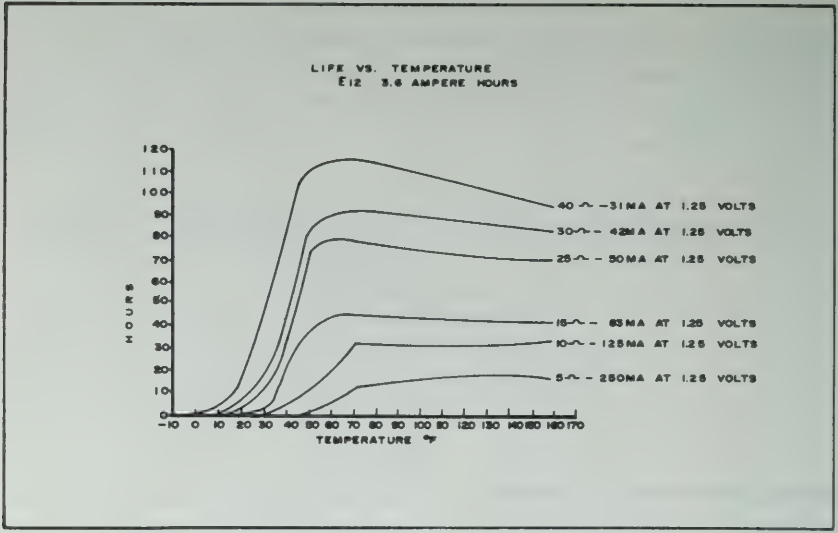
Stabilized battery characteristics are unaffected by the high temperatures encountered in applications such as subsurface oil well survey instruments.

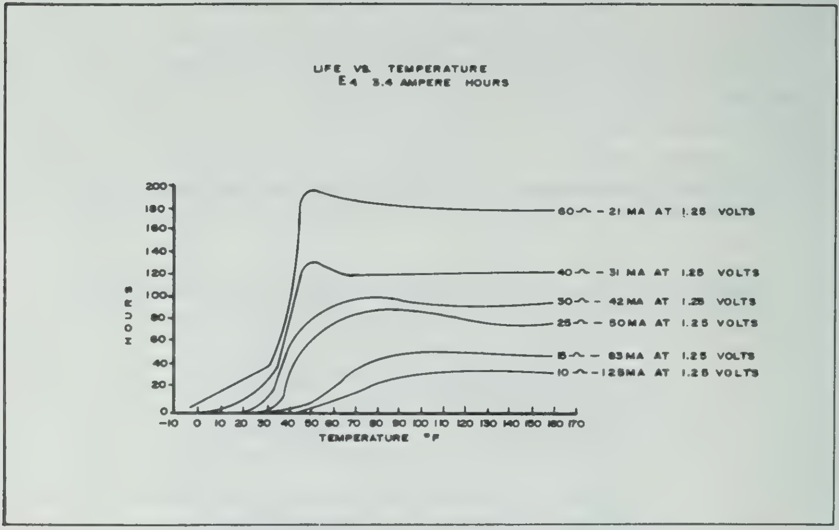
The following life curves show typical performance of flat and cylindrical mercury battery types, E4 and E12 respectively, over the temperature range of —65° to +160°F for current drains encountered in many applications. Voltage depression is slight at low temperatures when drains are 100 microamperes or less in the larger cell types, or when intermittent drains of this order are used with smaller cells.

MERCURY CELL EMF VS. TEMPERATURE AT LIGHT LOADS



MERCURY CELL EMF VS. TEMPERATURE AT LIGHT LOADS (Continued)





NOTE: Descriptive material and illustrations courtesy the licensor, Mallory Battery Company.

"EVEREADY"

Battery Type Numbers (in Order of Increasing Ampere-Hour Capacity)	SUGGESTED CURRENT RANGE (MILLIAMPERES)	SERVICE CAPACITY (MILLI AMPERE-HOURS)	SERVICE CAPACITY RATED AT (MILLI-AMPERES)	MAXIMUM DIMENSIONS — INCHES			
				DIAMETER	LENGTH	WIDTH	HEIGHT
1.35 AND 1.40 VOLT BATTERIES							
E312	0-3	36	2	0.310			0.140
E312E	0-3	36	2	0.310			0.140
E400N	0-7	75	2	0.455			0.135
E400E	0-7	75	2	0.455			0.135
E520E	0-10	130	5	0.495			0.286
E675	0-10	160	5	0.455			0.210
E675E	0-10	160	5	0.455			0.210
E625N	0-20	250	5	0.615			0.238
E625E	0-20	350	5	0.615			0.238
E450	0-30	350	3	0.455			0.570
E450E	0-30	350	3	0.455			0.570
E630	0-20	350	5	0.615			0.238
E630E	0-20	350	5	0.615			0.238
E640	0-50	500	15	0.625			0.440
E640E	0-50	500	15	0.625			0.440
E401	0-75	800	25	0.470			1.130
E401E	0-75	800	25	0.470			1.130
E1	0-100	1000	35	0.625			0.650
E1E	0-100	1000	35	0.625			0.650
E1N	0-100	1000	35	0.625			0.650
E140E	0-150	1600	50		0.990	0.515	1.227
E601	0-80	1800	30	0.627			1.140
E3	0-60	2200	42	0.985			0.660
E3E	0-60	2200	42	0.985			0.660
E502	0-200	2400	50	0.550			1.968
E502E	0-200	2400	25	0.550			1.968
E9	0-200	2400	25	0.550			1.968
E9N	0-200	2400	25	0.550			1.968
E4	0-80	3400	63	1.195			0.660
E4E	0-80	3400	63	1.195			0.660
E12	0-250	3600	62	0.640			1.968
E12E	0-250	3600	62	0.640			1.968
E12N	0-250	3600	62	0.640			1.968
E42	0-1000	14,000	250	1-9/32			2.390
E42N	0-1000	14,000	250	1-9/32			2.390
E302540	0-1000	14,000	250	1-13/64			2-25/64
E302651	0-1000	14,000	250	1-5/16			2-7/16
E302257	0-1000	14,400	248		1-3/8	1-3/8	2-1/4
E302463	0-1250	18,000	310	2-1/8			2-5/16
E302157	0-2000	28,000	500		2-1/2	1-3/8	4-1/4
E302510	0-3000	43,200	744		2-7/32	2-25/32	2-5/32
2.70 AND 2.80 VOLT BATTERIES							
E152N	0-30	350	3	0.485			1.140
E152E	0-30	350	3	0.485			1.140
E162	0-50	500	15	0.662			0.887
E120E	0-75	800	25		0.990	0.515	1.227
E122E	0-75	800	25		0.990	0.515	1.227
E132N	0-100	1000	35	0.662			1.315
E132B	0-100	1000	35	0.662			1.965
E132E	0-100	1000	35	0.662			1.315
E302702	0-60	2200	42	1-1/8			1-5/8
4.05 AND 4.20 VOLT BATTERIES							
E113	0-20	250	5	0.660			0.845
E302227	0-20	250	5	11/16			15/16
E153N	0-30	350	3	0.485			1.708
E163	0-50	500	15	0.662			1.327
E133	0-100	1000	35	0.662			1.965
E133E	0-100	1000	35	0.662			1.965
E133N	0-100	1000	35	0.662			1.965
E233	0-60	2200	42	1-1/64			1-31/32

MERCURY BATTERIES

1.35 AND 1.40 VOLT BATTERIES

Battery Type Numbers (in Order of Increasing Ampere-Hour Capacity)	NUMBER & SIZE OF CELLS		TYPICAL USE	WEIGHT OF BATTERY (OUNCES)	TERMINALS	Approx. Volume of Body of Battery (Cubic Inches)	VOLTAGE TAPS
	NUMBER	SIZE					
E312	1	312	Instruments	0.02	Flat Contacts	0.01	—, +1.40
E312E	1	312	Hearing Aids	0.02	Flat Contacts	0.01	—, +1.40
E400N	1	400	Instruments	0.04	Flat Contacts	0.02	—, +1.35
E400E	1	400	Hearing Aids	0.04	Flat Contacts	0.02	—, +1.40
E520E	1	520	Hearing Aids	0.07	Flat Contacts	0.05	—, +1.40
E675	1	675	Instruments	0.07	Flat Contacts	0.03	—, +1.40
E675E	1	675	Hearing Aids	0.07	Flat Contacts	0.03	—, +1.40
E625N	1	625	Instruments	0.14	Flat Contacts	0.07	—, +1.35
E625E	1	625	Hearing Aids	0.15	Flat Contacts	0.07	—, +1.40
E450	1	450	Instruments	0.18	Flat Contacts	0.09	—, +1.35
E450E	1	450	Hearing Aids	0.18	Flat Contacts	0.09	—, +1.40
E630	1	630	Transistor Radio	0.17	Flat Contacts	0.07	—, +1.40
E630E	1	630	Hearing Aids	0.17	Flat Contacts	0.07	—, +1.40
E640	1	640	Transistor Radio	0.38	Flat Contacts	0.13	—, +1.40
E640E	1	640	Hearing Aids	0.38	Flat Contacts	0.13	—, +1.40
E401	1	401 ("N")	Instrument, Radio	0.40	Flat Contacts	0.18	—, +1.40
E401E	1	401 ("N")	Hearing Aids	0.40	Flat Contacts	0.18	—, +1.40
E1	1	1	Instruments, Voltage Ref.	0.43	Flat Contacts	0.20	—, +1.35
E1E	1	1	Hearing Aids	0.43	Flat Contacts	0.20	—, +1.40
E1N	1	1	Instruments, Voltage Ref.	0.43	Flat Contacts	0.20	—, +1.35
E140E	2	401 ("N")	Hearing Aids	0.91	Flat Contacts	0.50	—, +1.40
E601	1	601	Instruments	1.22	Flat Contacts	0.33	—, +1.35
E3	1	3	Instruments	0.93	Flat Contacts	0.50	—, +1.35
E3E	1	3	Hearing Aids	0.93	Flat Contacts	0.50	—, +1.40
E502	1	502 ("AA")	Instruments	1.05	Flat Contacts	0.44	—, +1.35
E502E	1	502 ("AA")	Hearing Aids	1.05	Flat Contacts	0.44	—, +1.40
E9	1	502 ("AA")	Transistor Radio	1.05	Flat Contacts	0.44	—, +1.40
E9N	1	502 ("AA")	Transistor Radio	1.05	Flat Contacts	0.44	—, +1.40
E4	1	4	Instruments	1.6	Flat Contacts	0.74	—, +1.35
E4E	1	4	Hearing Aids	1.6	Flat Contacts	0.74	—, +1.40
E12	1	12 ("A")	Instruments, Voltage Ref.	1.4	Flat Contacts	0.60	—, +1.35
E12E	1	12 ("A")	Hearing Aids	1.4	Flat Contacts	0.60	—, +1.40
E12N	1	12 ("A")	Instruments, Voltage Ref.	1.4	Flat Contacts	0.60	—, +1.35
E42	1	42 ("D")	Instruments	5.85	Flat Contacts	2.90	—, +1.35
E42N	1	42 (D)	Instruments, Voltage Ref.	5.85	Flat Contacts	2.90	—, +1.35
E302540	1	42 ("D")	Test Equipment	6.0	Tabs	2.90	—, +1.35
E302651	1	42 ("D")	Instruments	6.14	Spec. Leads	2.90	—, +1.35
E302257	4	12 ("A")	Test Equipment	7.0	Wire Leads	4.25	—, +1.35
E302463	5	12 ("A")	Geophysical	8.0	Wire Leads	7.5	—, +1.35
E302157	2	42 ("D")	Radiation Equipment	13.5	Socket	13.4	—, +1.35
E302510	12	12 ("A")	Computer	21	Screw	12.3	—, +1.35

2.70 AND 2.80 VOLT BATTERIES

Battery Type Numbers	NUMBER	SIZE	TYPICAL USE	WEIGHT OF BATTERY (OUNCES)	TERMINALS	Approx. Volume of Body of Battery (Cubic Inches)	VOLTAGE TAPS
E152N	2	450	Instruments	0.42	Flat Contacts	0.19	—, +2.70
E152E	2	450	Hearing Aids	0.42	Flat Contacts	0.19	—, +2.80
E162	2	640	Instruments	0.58	Flat Contacts	0.28	—, +2.70
E120E	2	401 ("N")	Hearing Aids	0.91	Flat Contacts	0.50	—, +2.80
E122E	2	401 ("N")	Hearing Aids	0.88	Flat Contacts	0.50	—, +1.40,+2.80
E132N	2	1	Transistor Applications	0.90	Flat Contacts	0.43	—, +2.70
E132B	2 (plus one dummy)	1	Hearing Aids	1.10	Flat Contacts	0.65	—, +2.80
E132E	2	1	Hearing Aids	0.90	Flat Contacts	0.43	—, +2.80
E302702	2	3	Geophysical	2.0	Wire Leads	1.3	—, +2.70

4.05 AND 4.20 VOLT BATTERIES

Battery Type Numbers	NUMBER	SIZE	TYPICAL USE	WEIGHT OF BATTERY (OUNCES)	TERMINALS	Approx. Volume of Body of Battery (Cubic Inches)	VOLTAGE TAPS
E113	3	625	Instruments	0.45	Flat Contacts	0.28	—, +4.05
E302227	3	625	*pb* Meter	0.50	Tabs	0.30	—, +4.05
E153N	3	450	Instruments	0.60	Flat Contacts	0.22	—, +4.05
E163	3	640	Transistor Applications	0.87	Button	0.44	—, +4.20
E133	3	1	Transistor Radio	1.4	Button	0.65	—, +4.20
E133E	3	1	Hearing Aids	1.4	Button	0.65	—. +4.20
E133N	3	1	Instruments, Voltage Ref.	1.4	Button	0.65	—, +4.05
E233	3	3	Transistor Radio	3.0	Button	1.60	—, +4.20

Battery Type Numbers (in Order of Increasing Ampere-Hour Capacity)	SUGGESTED CURRENT RANGE (MILLIAMPERES)	SERVICE CAPACITY (MILLI-AMPERE-HOURS)	SERVICE CAPACITY RATED AT (MILLI-AMPERES)	MAXIMUM DIMENSIONS — INCHES			
				DIAMETER	LENGTH	WIDTH	HEIGHT
5.40 AND 5.60 VOLT BATTERIES							
E114	0-20	250	5	0.660			1.080
E302229	0-20	250	5	11/16			1-7/32
E302354	0-20	250	5	3/4			1-1/4
E164	0-50	500	15	0.662			1.767
EPX-4	0-50	500	15	0.662			1.965
E134N	0-100	1000	35	0.662			2.620
E302467	0-100	1000	35	11/16			2-7/8
E234	0-60	2200	42	1-1/64			2-5/8
E302351	0-60	2200	42	1-1/16			2-5/8
E302904	0-80	3400	63	1-11/32			2-31/32
E302519	0-500	7200	124		2-3/4	1-7/16	2-11/32
6.75 AND 7.00 VOLT BATTERIES							
E175	0-10	160	5	1/2			1-3/32
E115N	0-20	250	5	0.660			1.320
E302249	0-20	250	5	23/32			1-15/32
E302435	0-20	250	5	11/16			1-1/2
E145	0-20	350	5	0.660			1-3/16
E165	0-50	500	15	0.662			2-7/32
E135N	0-100	1000	35	0.662			3.275
E302424	0-100	1000	35	11/16			3-15/32
E302497	0-60	2200	42	1-1/16			4-1/8
E302125	0-80	2400	63	1-11/32			3-1/32
E302642	0-80	2400	63	1-9/32			2-5/8
E302905	0-80	3400	63	1-11/32			3-19/32
E302464	0-250	3600	62	2-1/8			2-5/16
E302667	0-1000	14,000	250		6-15/32	1-15/32	2-23/32
8.1 AND 8.4 VOLT BATTERIES							
E146	0-30	350	3		1-1/32	5/8	2
E126	0-40	600	15	3/4			2
E136N	0-100	1000	35	0.662			3.930
E303035	0-80	3400	63	1-9/32			4-1/32
9.45 AND 9.80 VOLT BATTERIES							
E177	0-10	160	5	35/64			1-29/32
E302250	0-20	250	5	11/16			1-29/32
E302437	0-20	250	5	11/16			1-31/32
E137N	0-100	1000	35	0.662			4.585
E302478	0-80	2400	63	1-9/32			3-5/8
E302907	0-80	3400	63	1-5/16			4-7/8
E302896	0-250	3600	62		2-9/16	1-13/16	2-1/4
10.8 VOLT BATTERIES							
E302358	0-20	250	5	3/4			2-5/32
E302908	0-80	3400	63	1-11/32			5-9/16
E302795	0-250	3600	62		1-7/16	1-7/16	4-29/32
12.15 AND 12.6 VOLT BATTERIES							
EPX-6	0-50	500	15	0.662			4.090
E169	0-50	500	15	0.662			3-63/64
E302830	0-100 0-500	1000 7200	35 124		3-15/32	7/8	6-1/2

Battery Type Numbers (in Order of Increasing Ampere-Hour Capacity)	NUMBER & SIZE OF CELLS		TYPICAL USE	WEIGHT OF BATTERY (OUNCES)	TERMINALS	Approx. Volume of Body of Battery (Cubic Inches)	VOLTAGE TAPS
	NUMBER	SIZE					
5.40 AND 5.60 VOLT BATTERIES							
E114	4	625	Instruments	0.59	Flat Contacts	0.35	—, +5.40
E302229	4	625	*pb* Meter	0.62	Tabs	0.40	—, +5.40
E302354	4	625	Radiation Equipment	0.50	Wire Leads	0.40	—, +5.40
E164	4	640	Transistor Radio	1.16	Flat Contacts	0.61	—, +5.60
EPX-4	4	640	Camera	1.16	Flat Contacts	0.68	—, +5.40
E134N	4	1	Instruments	1.9	Flat Contacts	0.80	—, +5.40
E302467	4	1	Test Equipment	2.0	Tabs	0.94	—, +5.40
E234	4	3	Instruments	3.88	Flat Contacts	2.13	—, +5.60
E302351	4	3	Fire Alarm	4.5	Flat Contacts	2.3	—, +5.40
E302904	4	4	Meter	6.0	Wire Leads	3.6	—, +5.40
E302519	8	12 ("A")	Test Equipment	15	Wire Leads	8.4	—, +5.40
6.75 AND 7.00 VOLT BATTERIES							
E175	5	675	Transistor Radio	1.0	Flat Contacts	0.22	—, +7.00
E115N	5	625	Instruments	0.73	Flat Contacts	0.44	—, +6.75
E302249	5	625	Radiation Equipment	0.75	Tabs	0.60	—, +6.75
E302435	5	625	Radiation Equipment	0.75	Flat Contacts	0.53	—, +6.75
E145	5	625	Transistor Devices	0.7	Button	0.4	—, +7.00
E165	5	640	TV Tuner	1.45	Flat Contacts	0.73	—, +7.00
E135N	5	1	Instruments	2.4	Flat Contacts	1.08	—, +6.75
E302424	5	1	Instruments	2.5	Tabs	1.21	—, +6.75
E302497	5	3	Test Equipment	6.0	Screw	3.0	—, +6.75
E302125	5	4Z	Fire Alarm	7.0	Wire Leads	3.9	—, +7.00
E302642	5	4Z	Fire Alarm	5.0	Flat Contacts	3.1	—, +7.00
E302905	5	4	Test Equipment	9.0	Wire Leads	4.5	—, +6.75
E302464	5	12	Geophysical	8.0	Wire Leads	7.5	—, +6.75
E302667	5	42	Instruments	30.7	Wire Leads	25.8	—, +6.75
8.1 AND 8.4 VOLT BATTERIES							
E146	6	450	Transistor Radio	1.6	Min. Snap	0.9	—, +8.40
E126	6	660	Transistor Radio	1.65	Flat Contacts-Neg. Recessed	0.82	—, +8.4
E136N	6	1	Instruments	2.9	Flat Contacts	1.29	—, +8.10
E303035	6	4	Instruments	10.0	Flat Contacts	5.2	—, +8.10
9.45 AND 9.80 VOLT BATTERIES							
E177	7	675	Transistor Radio	0.67	Min. Snap	0.38	—, +9.80
E302250	7	625	Radiation Equipment	1.0	Tabs	0.64	—, +9.45
E302437	7	625	Radiation Equipment	1.0	Flat Contacts	0.65	—, +9.45
E137N	7	1	Instruments	3.3	Flat Contacts	1.58	—, +9.45
E302478	7	4Z	Wire Recorder	9.0	Flat Contacts	4.4	—, +9.80
E302907	7	4	Instruments	11.6	Wire Leads	6.6	—, +9.45
E302896	8	12	Recorder	11.8	3 Neg. Snap	10.5	—, +9.45 —, +1.35
10.8 VOLT BATTERIES							
E302358	8	625	Radiation Equipment	0.87	Wire Leads	0.78	—, +10.8
E302908	8	4	Radiation Equipment	12.0	Wire Leads	7.1	—, +10.8
E302795	8	12	Instruments	11.8	Socket	10.2	—, +10.8
12.15 AND 12.6 VOLT BATTERIES							
EPX-6	9	640	Camera	1.6	Flat Contacts	1.41	—, +5.40, +12.15
E169	9	640	Instruments	4.2	Flat Contacts	1.37	—, +12.6
E302830	9 10	1 12	Instruments	24	Socket Socket	19.8	—, +12.15 —, +6.75

Battery Type Numbers (in Order of Increasing Ampere-Hour Capacity)	SUGGESTED CURRENT RANGE (MILLI-AMPERES)	SERVICE CAPACITY (MILLI-AMPERE-HOURS)	SERVICE CAPACITY RATED AT (MILLI-AMPERES)	MAXIMUM DIMENSIONS — INCHES			
				DIAMETER	LENGTH	WIDTH	HEIGHT
13.5 VOLT BATTERIES							
E302360	0-20	250	5	3/4			2-11/16
E302271	0-20 0-250	250 3600	5 62	45/64			4-5/8
16.2 VOLT BATTERIES							
E302362	0-20	250	5	23/32			3-5/32
E302506	0-20	250	5		1-3/8	3/4	2-1/8
21.6 VOLT BATTERIES							
E302539	0-20	250	5		1-3/8	3/4	3-1/32
E302589	0-20	250	5		1-7/16	1-7/16	1-15/16
24.3 VOLT BATTERY							
E302240	0-200	2400	50		2-1/4	1-3/8	5-9/32
27.0 VOLT BATTERY							
E302580	0-80	3400	63		2-23/32	2-23/32	3-29/32
29.7 VOLT BATTERY							
E302579	0-20	250	5		1-13/32	3/4	3-3/16
47.25 VOLT BATTERIES							
E302158	0-50	500	15		3-1/4	1-3/8	4-1/4
E302465	0-100	1000	35	2-3/16			3-3/4
48.6 VOLT BATTERY							
E302425	0-20	250	5		2-13/16	1	2-25/32
64.8 VOLT BATTERIES							
E302499	0-50	500	15		2-3/4	1-3/8	3-21/32
E302558	0-50	500	15		2-3/4	1-3/8	3-21/32
75.6 VOLT BATTERY							
E302800	0-100	1000	35		2-3/4	1-7/16	5
94.5 VOLT BATTERY							
E302502	0-20	250	5	2-3/32			2-31/32
97.2 VOLT BATTERIES							
E302527	0-20	250	5		2-5/32	1-15/32	3-3/8
E302554	0-20	250	5		2-5/32	1-15/32	3-5/8
E302462	0-100	1000	35		2-13/16	1-17/32	6-3/8

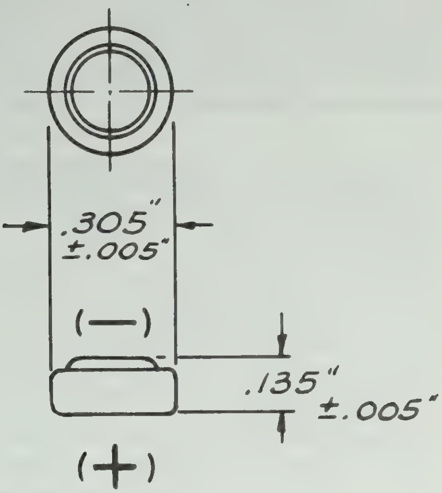
NOTE: To provide greatest passivity to internal cell materials, use nickel-plated steel or stainless steel battery contacts. Copper alloys should not be used.

Battery Type Numbers (in Order of Increasing Ampere-Hour Capacity)	NUMBER & SIZE OF CELLS		TYPICAL USE	WEIGHT OF BATTERY (OUNCES)	TERMINALS	Approx. Volume of Body of Battery (Cubic Inches)	VOLTAGE TAPS
	NUMBER	SIZE					
13.5 VOLT BATTERIES							
E302360	10	625	Radiation Equipment	1.0	Wire Leads	0.99	—, +13.5
E302271	9 1	625 12	Instruments	3.0	Wire Leads	0.53	—, +13.5 —, +1.35
16.2 VOLT BATTERIES							
E302362	12	625	Radiation Equipment	1.13	Wire Leads	1.13	—, +16.2
E302506	15	625	Telemetry	3.0	Wire Leads	2.04	+, —16.2 —, +4.05
21.6 VOLT BATTERIES							
E302539	16	625	Instruments	2.35	Socket	3.12	—, +21.6
E302589	16	625	Instruments	2.35	Socket	4.0	—, +21.6
24.3 VOLT BATTERY							
E302240	18	502	Instruments	19.0	Wire Leads	15	—, +24.3
27.0 VOLT BATTERY							
E302580	20	4	Instruments	33.6	Socket	28.8	—, +27.0
29.7 VOLT BATTERY							
E302579	22	625	Test Equipment	5.0	Wire Leads	2.90	—, +29.7
47.25 VOLT BATTERIES							
E302158	56	640	Radiation Equipment	19.0	Socket	17.5	—, +47.25 —, +22.95 —, +2.70, +5.40
E302465	35	1	Geophysical	17.0	Wire Leads	12.1	—, +47.25
48.6 VOLT BATTERY							
E302425	36	625	"B" Battery	8.0	Snap	7.0	—, +48.6
64.8 VOLT BATTERIES							
E302499	48	640	Missile	16.0	Wire Leads	12.7	—, +64.8
E302558	48	640	Missile	15.0	Wire Leads	12.7	—, +35.1, +64.8
75.6 VOLT BATTERY							
E302800	56	1	Instruments	25.3	Snap	19.8	—, +75.6
94.5 VOLT BATTERY							
E302502	70	625	Geophysical	10.5	Wire Leads	9.70	—, +94.5
97.2 VOLT BATTERIES							
E302527	72	625	"B" Battery	10.0	Wire Leads	9.74	—, +97.2
E302554	72	625	"B" Battery	10.0	Snap	11.0	—, +97.2
E302462	72	1	Transmitter "B"	32.0	Wire Leads	25.6	—, +97.2

"EVEREADY" NO. E312E CELL

Type — Mercury

Suggested Current Range: 0-3 milliamperes



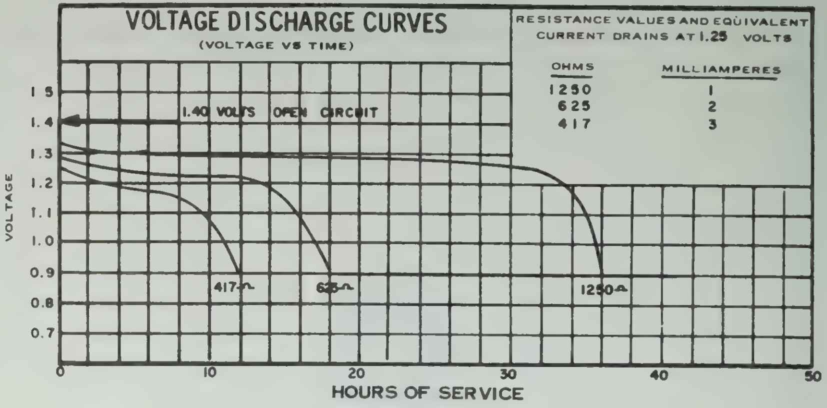
SPECIFICATIONS

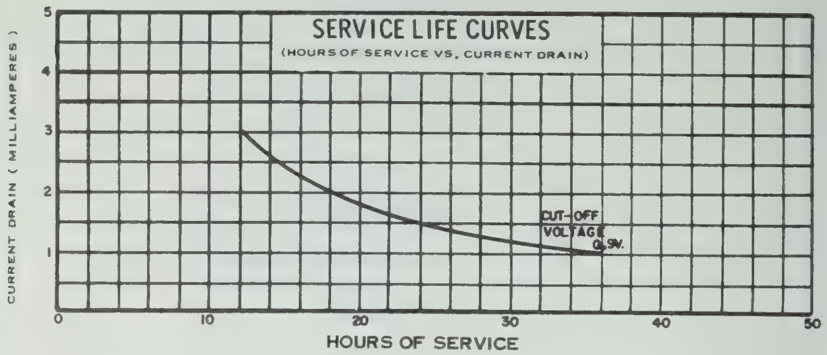
Voltage Taps	–, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 2 milliamperes)	36 milliampere-hours
Terminals	Button
Average Weight	0.02 oz.
Volume	0.01 cubic inches
Cell	One No. 312

For service information see reverse side of this sheet

"EVEREADY" NO. E312E

Estimated Service at 70°F



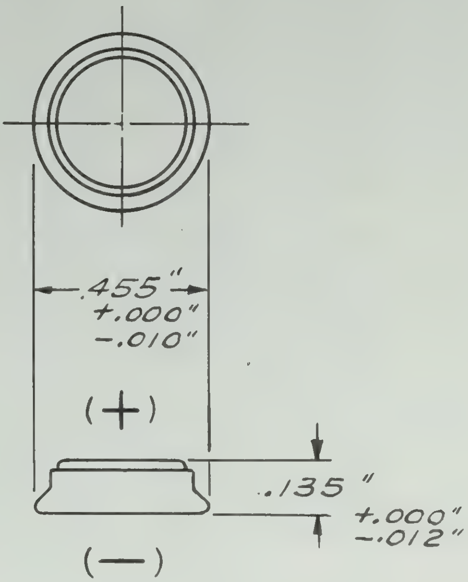


NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E400E CELL

Type — Mercury

Suggested Current Range: 0-7 milliamperes



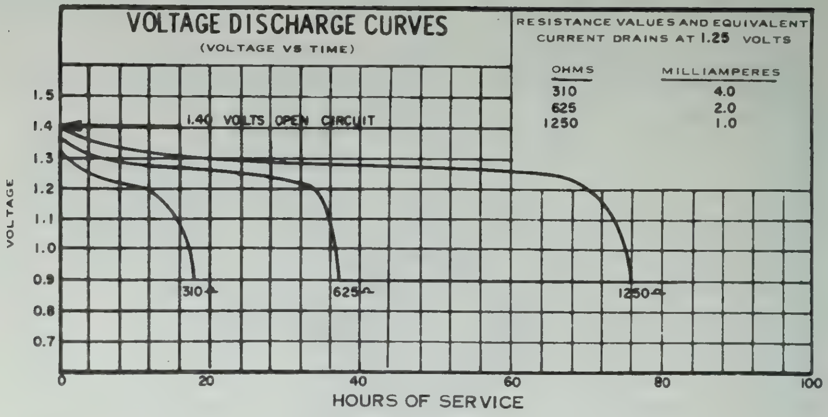
SPECIFICATIONS

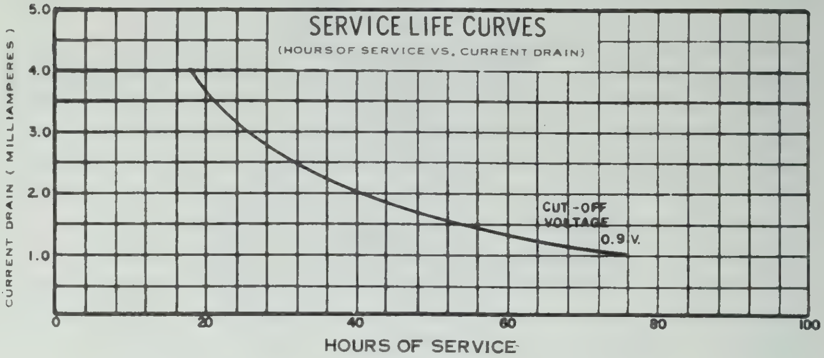
Voltage Taps	—, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 2 milliamperes)	75 milliampere-hours
Terminals	Button
Average Weight	0.04 oz.
Volume	0.02 cubic inches
Cell	One No. 400

For service information see reverse side of this sheet

"EVEREADY" NO. E400E

Estimated Service at 70°F



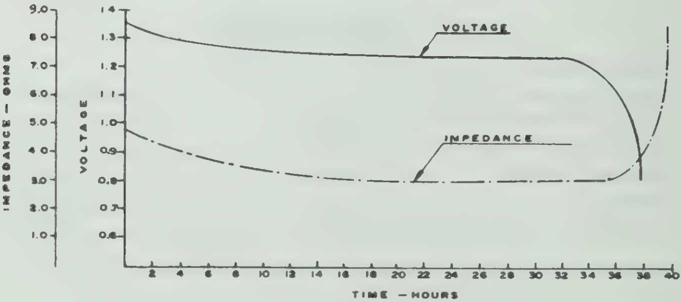


NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

Impedance at 1 KC under 625 Ohm Load (70°F)

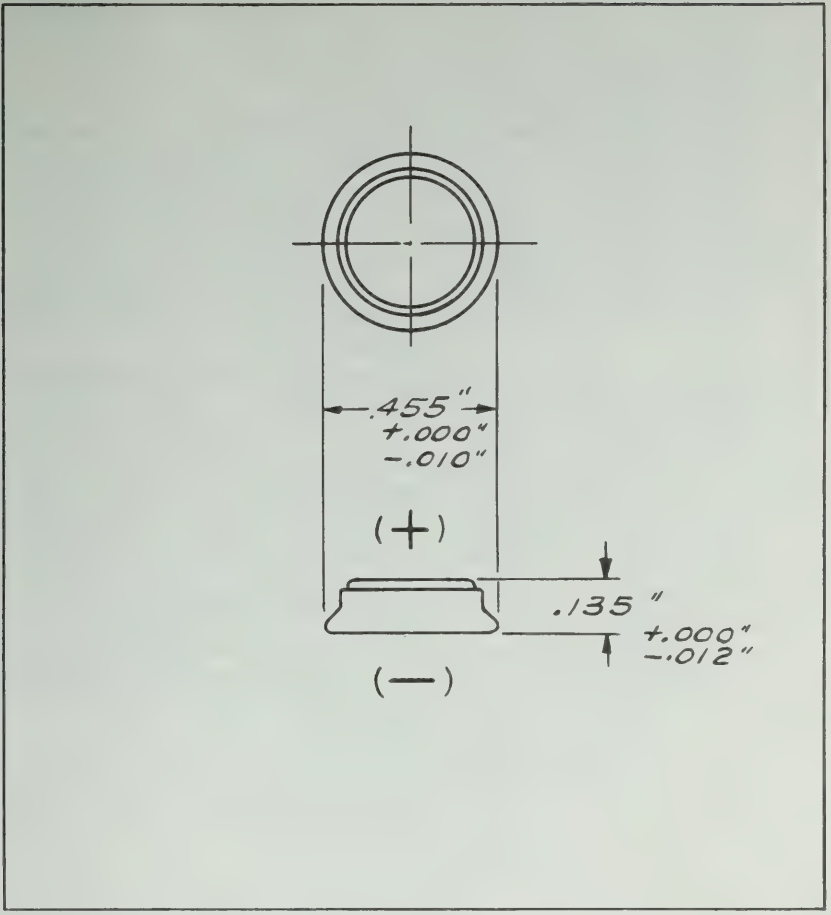
THIS IMPEDANCE TAKEN AT THE INDICATED DRAIN.

THIS CURVE IS REPRESENTATIVE OVER THE RANGE OF CURRENT FROM 1 MA TO 17 MA.



"EVEREADY" NO. E400N CELL

Type — Mercury
NEDA Number — 1106
Suggested Current Range: 0-7 milliamperes



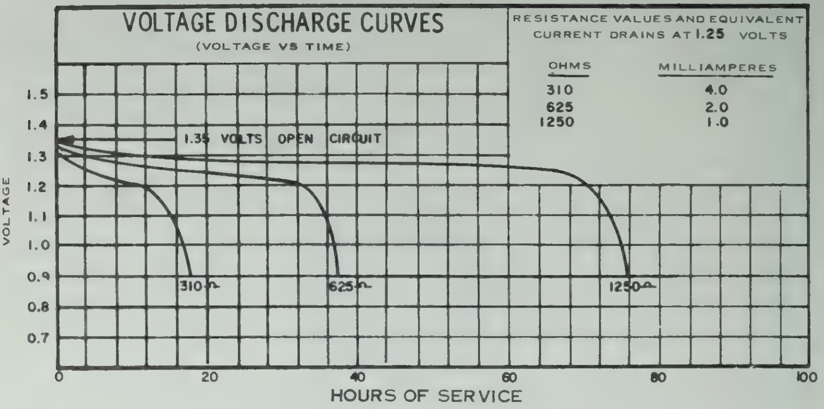
SPECIFICATIONS

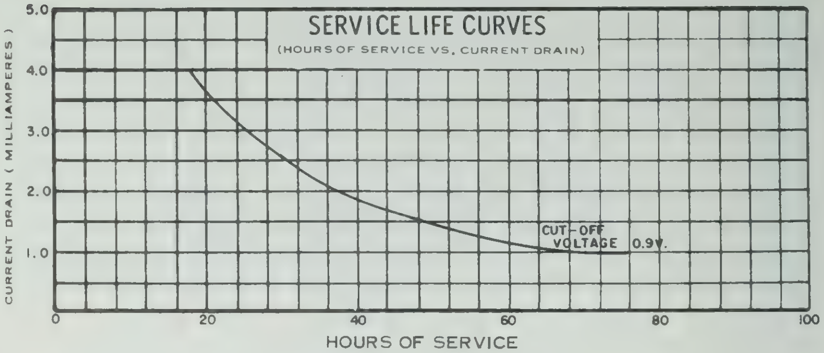
Voltage Taps	—, + 1.35
Service Capacity (to 0.9 volt) (Rated capacity at 2 milliamperes)	75 milliampere-hours
Terminals	Button
Average Weight	0.04 oz.
Volume	0.02 cubic inches
Cell	One No. 400

For service information see reverse side of this sheet

"EVEREADY" NO. E400N

Estimated Service at 70°F





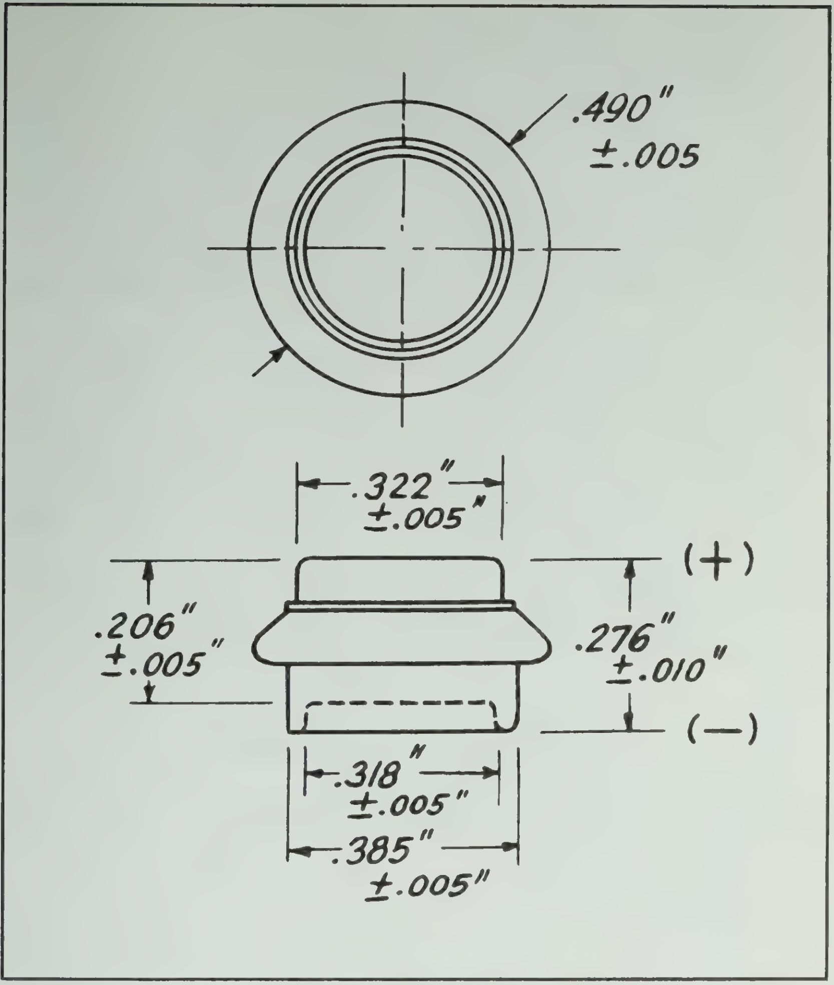
NOTES
CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

1.40
Volts

"EVEREADY" NO. E520E CELL

Type — Mercury

Suggested Current Range: 0-10 milliamperes



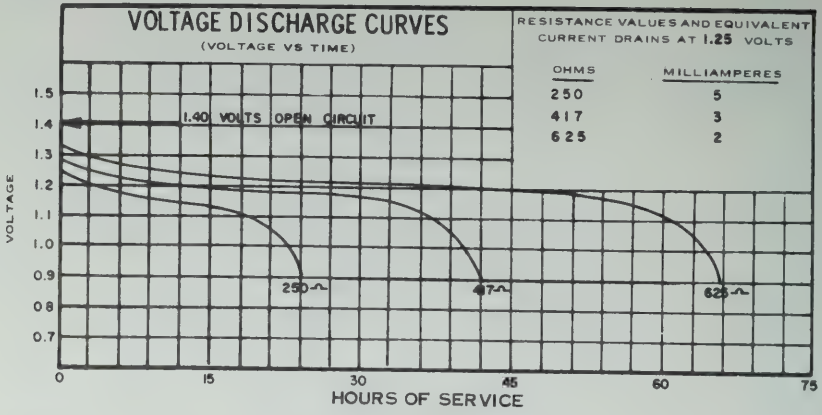
SPECIFICATIONS

Voltage Taps	—, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 5 milliamperes)	130 milliampere-hours
Terminals	Button
Average Weight	0.07 oz.
Volume	0.05 cubic inches
Cell	One No. 520

For service information see reverse side of this sheet

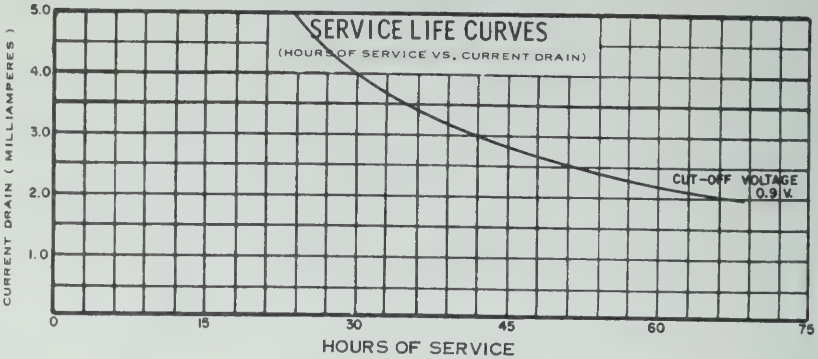
"EVEREADY" NO. E520E

Estimated Service at 70°F



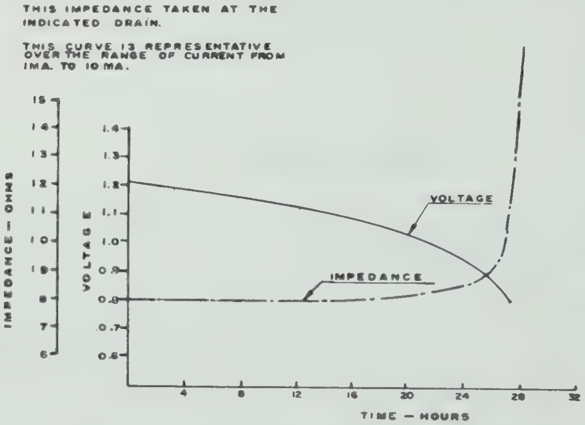
RESISTANCE VALUES AND EQUIVALENT CURRENT DRAINS AT 1.25 VOLTS

OHMS	MILLIAMPERES
250	5
417	3
625	2



NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

Impedance at 1 KC under 250 Ohm Load (70°F)



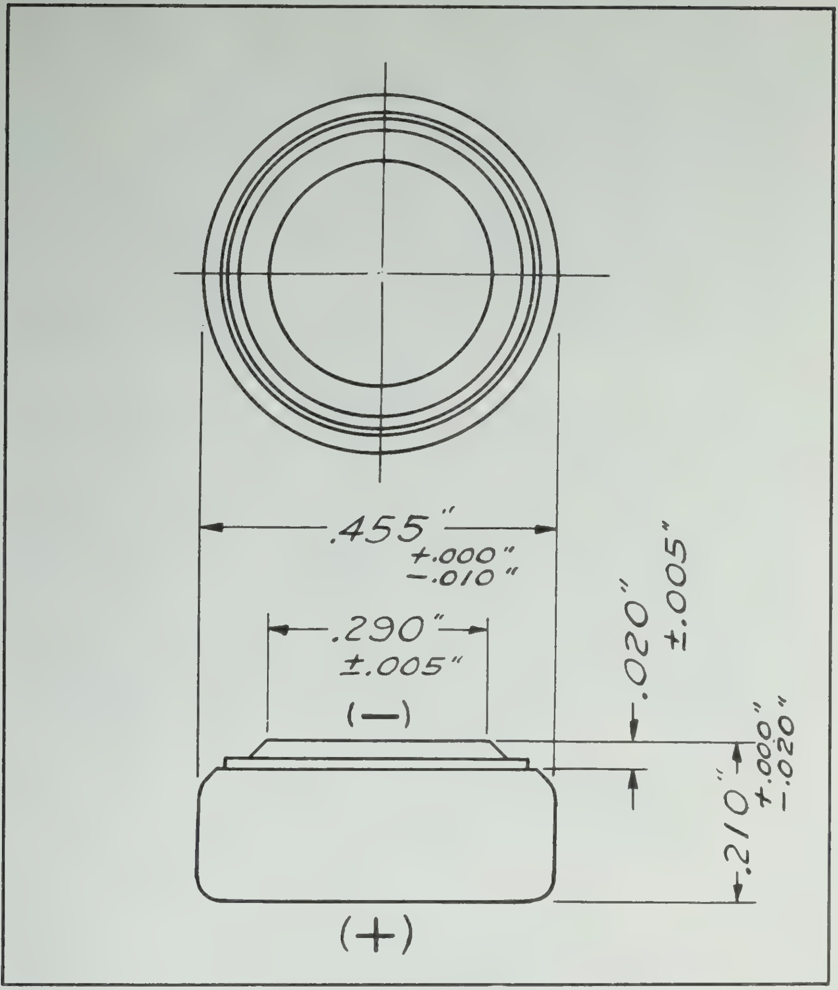
THIS IMPEDANCE TAKEN AT THE INDICATED DRAIN.

THIS CURVE IS REPRESENTATIVE OVER THE RANGE OF CURRENT FROM 1MA. TO 10 MA.

"EVEREADY" NO. E675 CELL

Type—Mercury

Suggested Current Range: 0-10 milliamperes



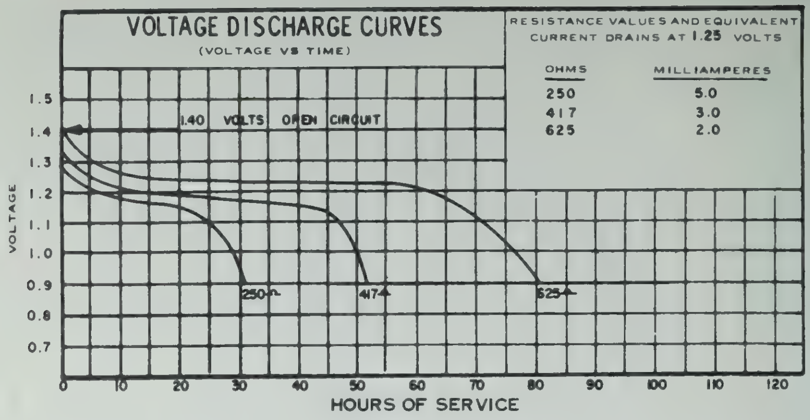
SPECIFICATIONS

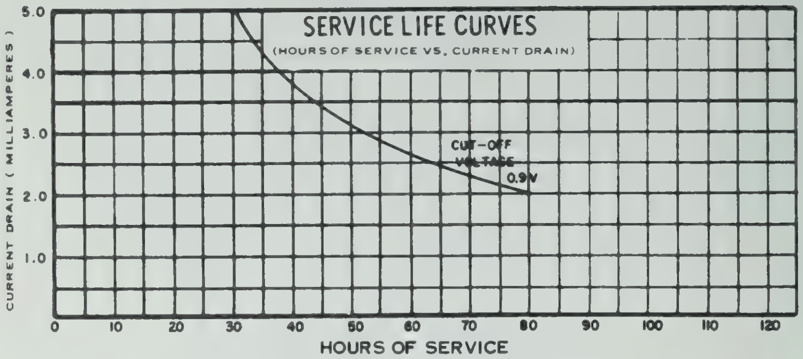
Voltage Taps	—, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 5 milliamperes)	160 milliampere-hours
Terminals	Button
Average Weight	0.07 oz.
Volume	0.03 cubic inches
Cell	One No. 675

For service information see reverse side of this sheet

"EVEREADY" NO. E675

Estimated Service at 70°F



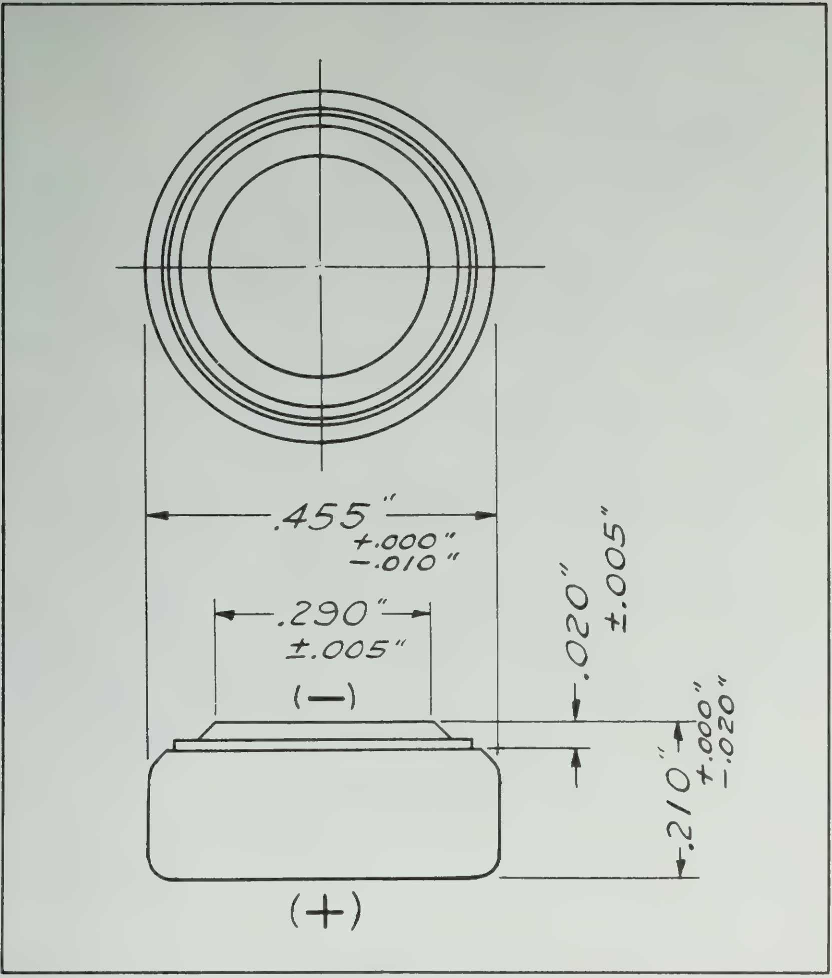


NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E675E CELL

Type — Mercury

Suggested Current Range: 0-10 milliamperes



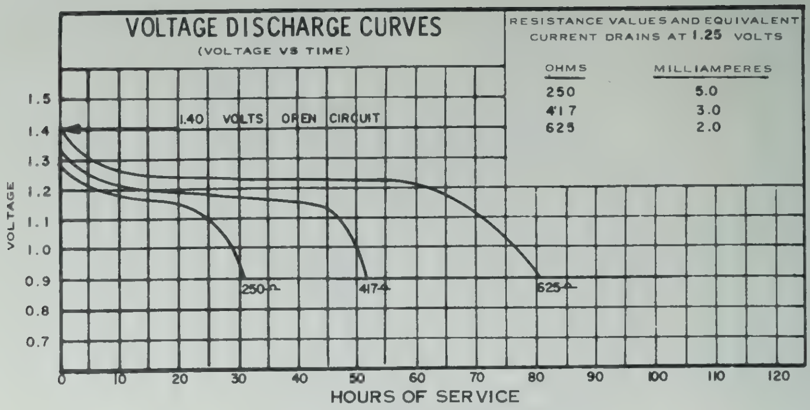
SPECIFICATIONS

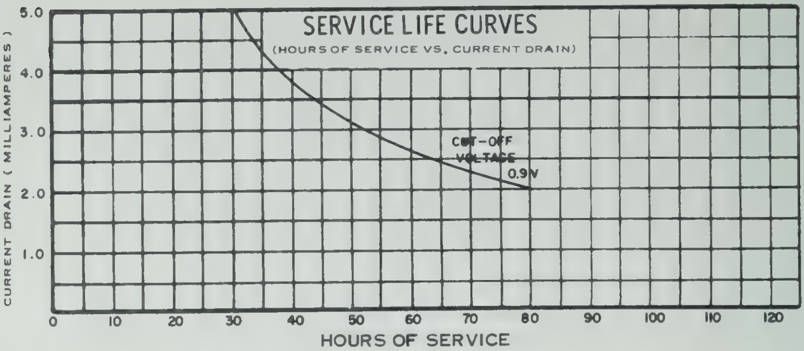
Voltage Taps	−, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 5 milliamperes)	160 milliampere-hours
Terminals	Button
Average Weight	0.07 oz.
Volume	0.03 cubic inches
Cell	One No. 675

For service information see reverse side of this sheet

"EVEREADY" NO. E675E

Estimated Service at 70°F



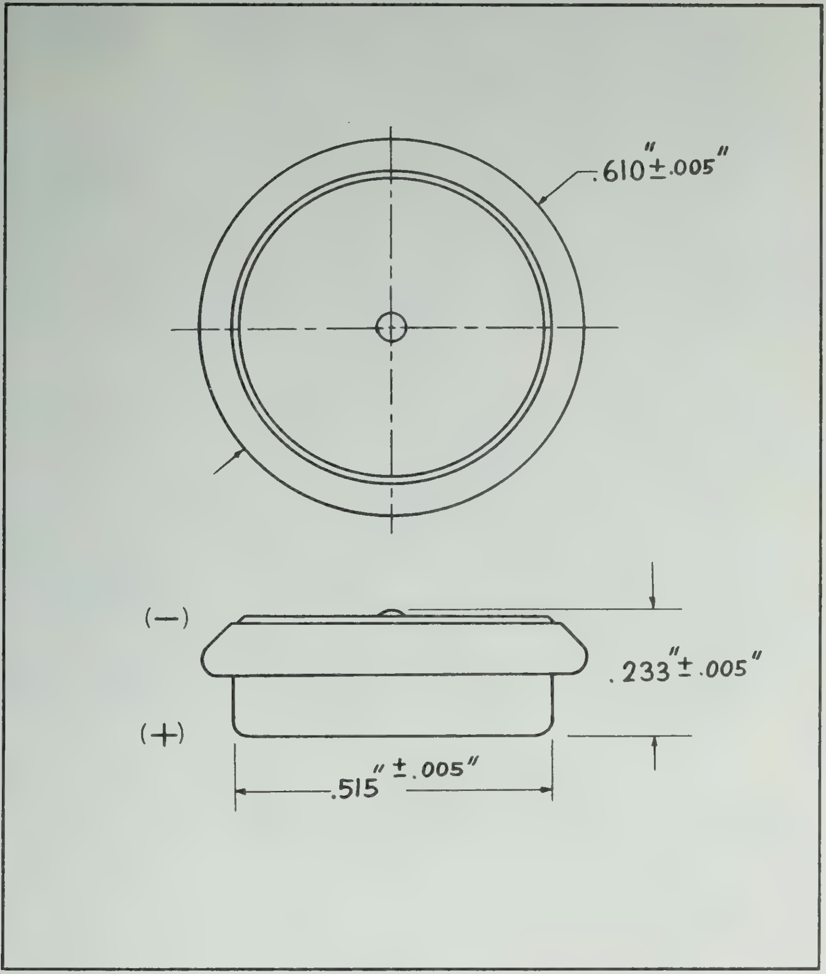


NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E625E CELL

Type — Mercury

Suggested Current Range: 0-20 milliamperes



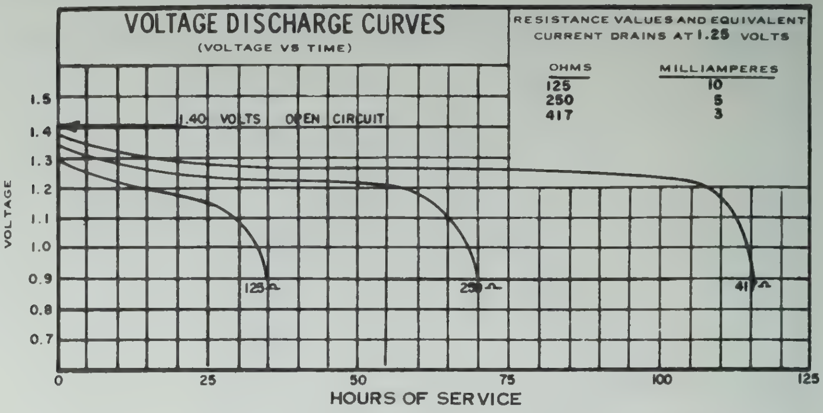
SPECIFICATIONS

Voltage Taps	−, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 5 milliamperes)	350 milliampere-hours
Terminals	Button
Average Weight	0.15 oz.
Volume	0.07 cubic inches
Cell	One No. 625

For service information see reverse side of this sheet

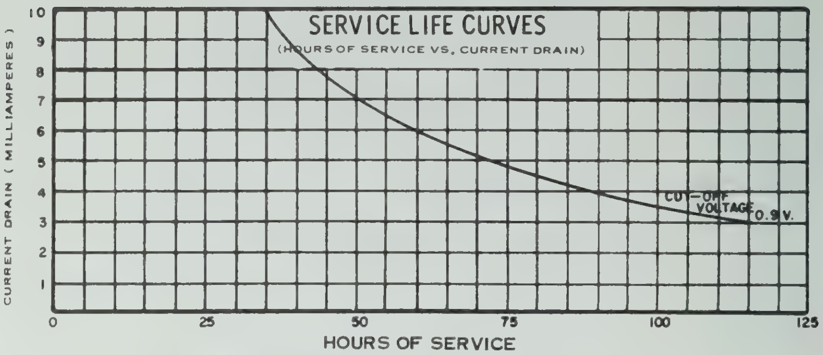
"EVEREADY" NO. E625E

Estimated Service at 70°F



RESISTANCE VALUES AND EQUIVALENT CURRENT DRAINS AT 1.25 VOLTS

OHMS	MILLIAMPERES
125	10
250	5
417	3

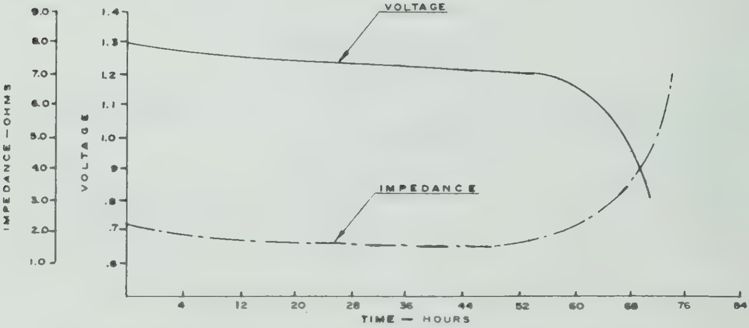


NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

Impedance at 1KC under 250 Ohm Load (70°F)

THIS IMPEDANCE TAKEN AT THE INDICATED DRAIN

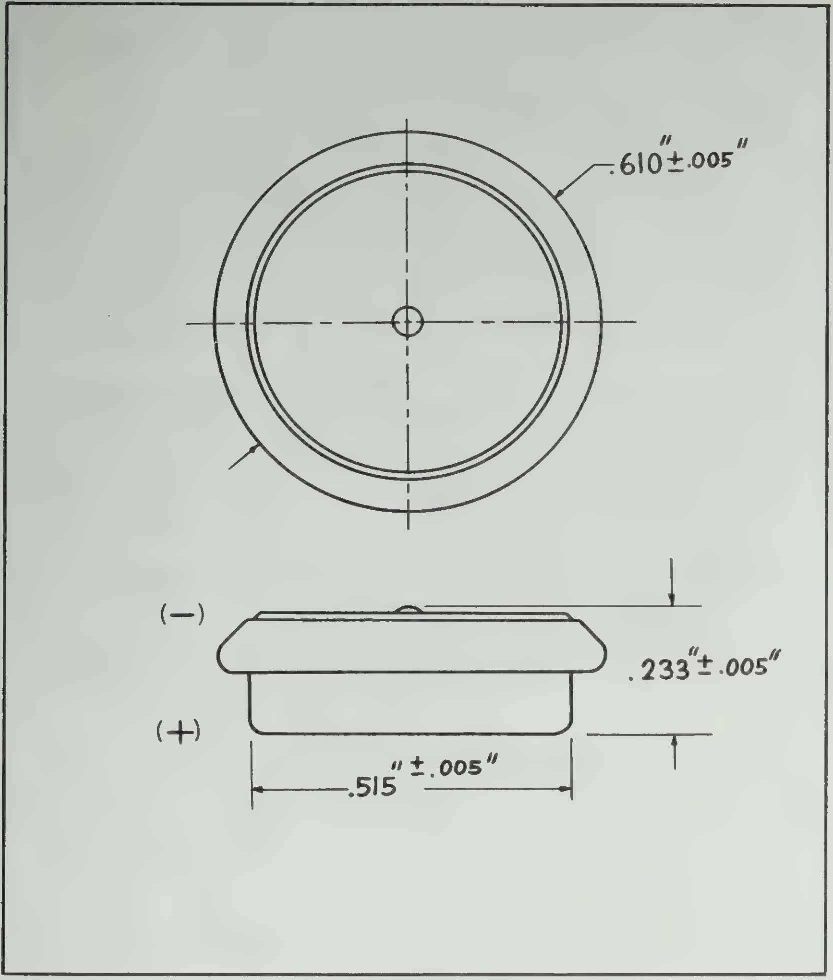
THIS CURVE IS REPRESENTATIVE OVER THE RANGE OF CURRENT FROM 1MA TO 20MA.



"EVEREADY" NO. E625N CELL

Type — Mercury

Suggested Current Range: 0-20 milliamperes



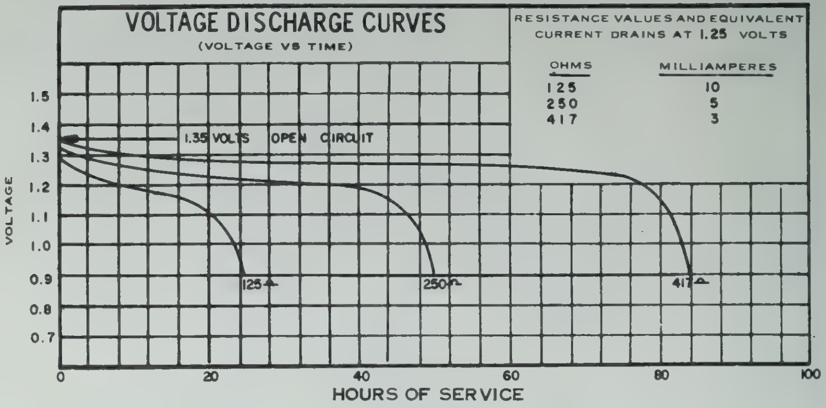
SPECIFICATIONS

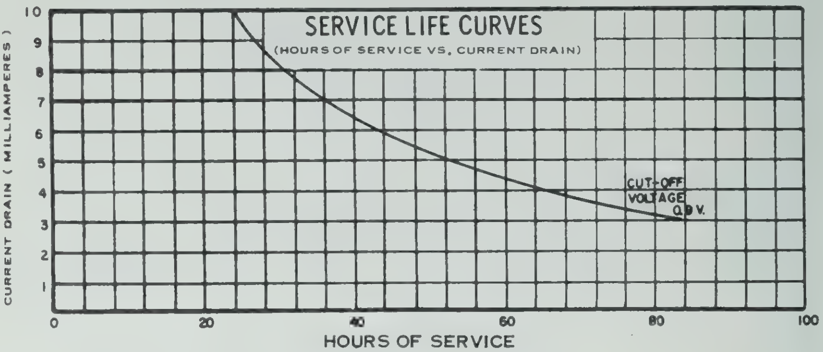
Voltage Taps..−, + 1.35
Service Capacity (to 0.9 volt)........................250 milliampere-hours
(Rated capacity at 5 milliamperes)
Terminals .... Button
Average Weight...0.14 oz.
Volume...0.07 cubic inches
Cell...One No. 625

For service information see reverse side of this sheet

"EVEREADY" NO. E625N

Estimated Service at 70°F



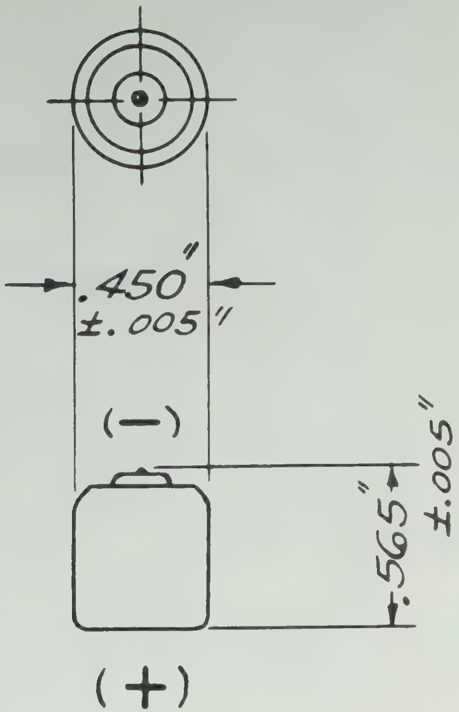


NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E450 CELL

Type—Mercury

Suggested Current Range: 0-30 milliamperes



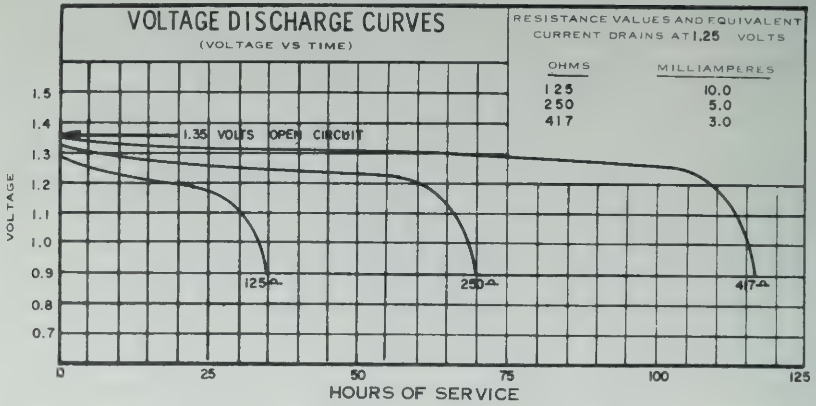
SPECIFICATIONS

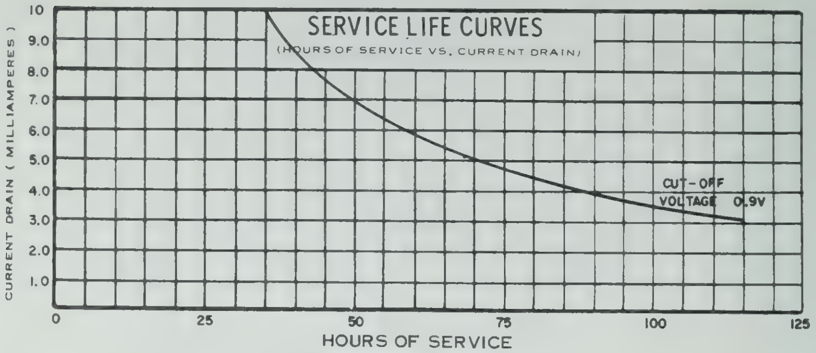
Voltage Taps	—, + 1.35
Service Capacity (to 0.9 volt)	350 milliampere-hours
(Rated Capacity at 3 milliamperes)	
Terminals	Button
Average Weight	0.18 oz.
Volume	0.09 cubic inches
Cell	One No. 450

For service information see reverse side of this sheet

"EVEREADY" NO. E450

Estimated Service at 70°F



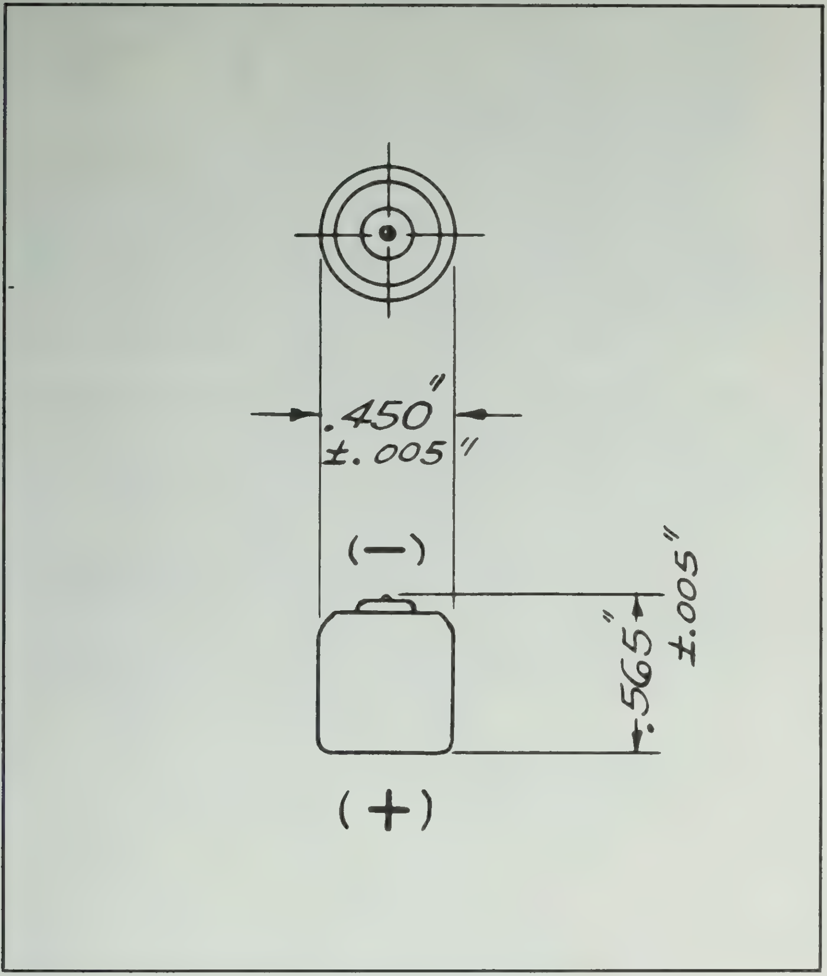


NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E450E CELL

Type — Mercury

Suggested Current Range: 0-30 milliamperes



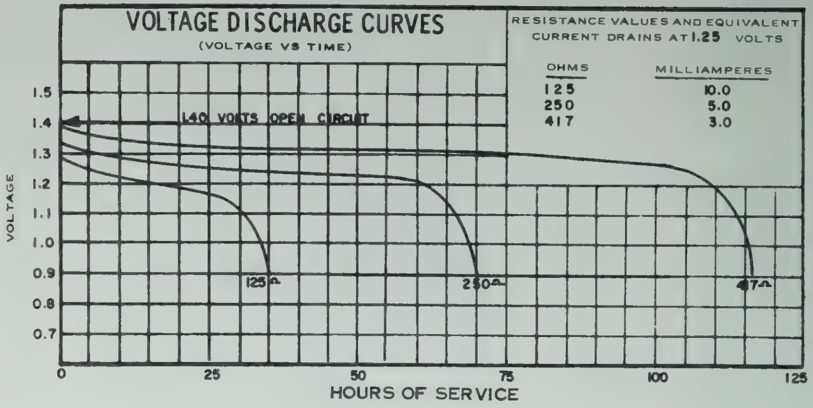
SPECIFICATIONS

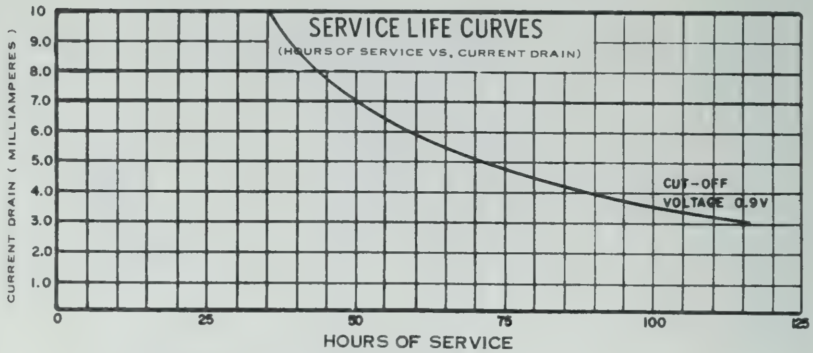
Voltage Taps	−, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 3 milliamperes)	350 milliampere-hours
Terminals	Button
Average Weight	0.18 oz.
Volume	0.09 cubic inches
Cell	One No. 450

For service information see reverse side of this sheet

"EVEREADY" NO. E450E

Estimated Service at 70°F.





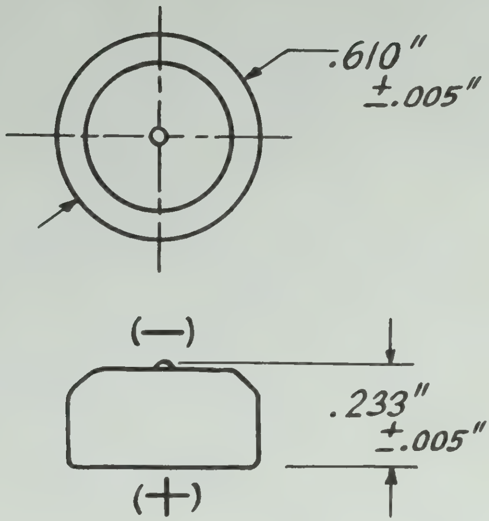
NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E630 CELL

Type — Mercury

NEDA Number — 1104

Suggested Current Range: 0-20 milliamperes



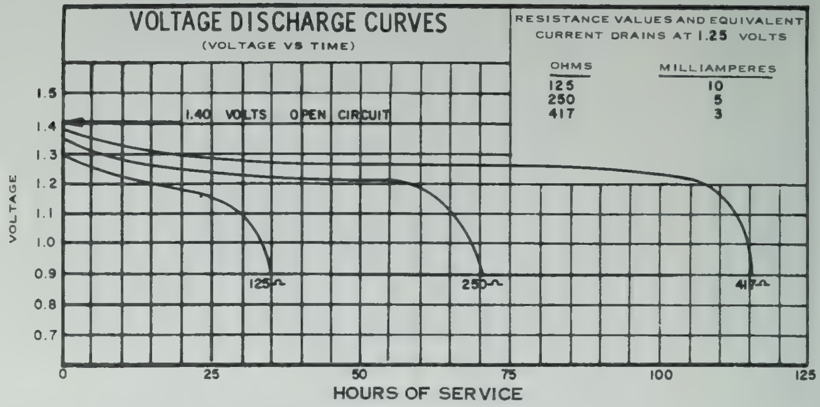
SPECIFICATIONS

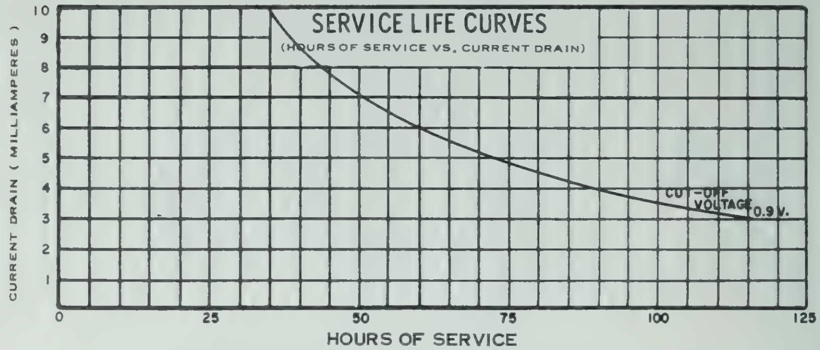
Voltage Taps	—, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 5 milliamperes)	350 milliampere-hours
Terminals	Button
Average Weight	0.17 oz.
Volume	0.07 cubic inches
Cell	One No. 630

For service information see reverse side of this sheet

"EVEREADY" NO. E630

Estimated Service at 70°F.



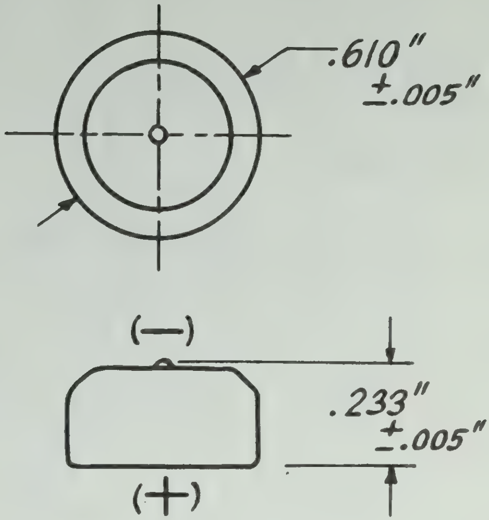


NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E630E CELL

Type — Mercury

Suggested Current Range: 0-20 milliamperes



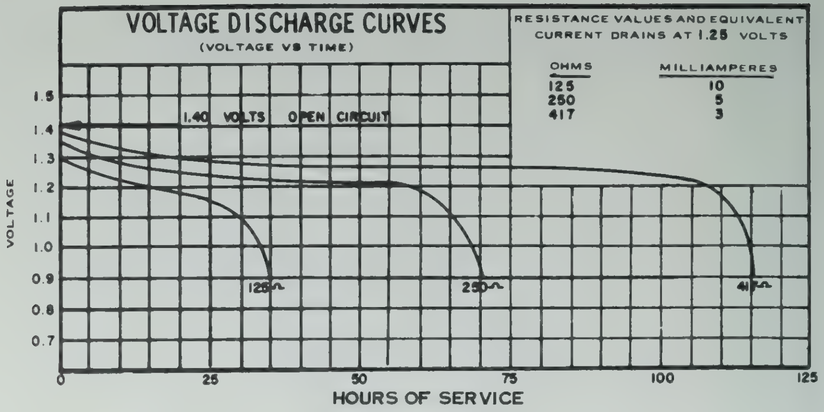
SPECIFICATIONS

Voltage Taps	—, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 5 milliamperes)	350 milliampere-hours
Terminals	Button
Average Weight	0.17 oz.
Volume	0.07 cubic inches
Cell	One No. 630

For service information see reverse side of this sheet

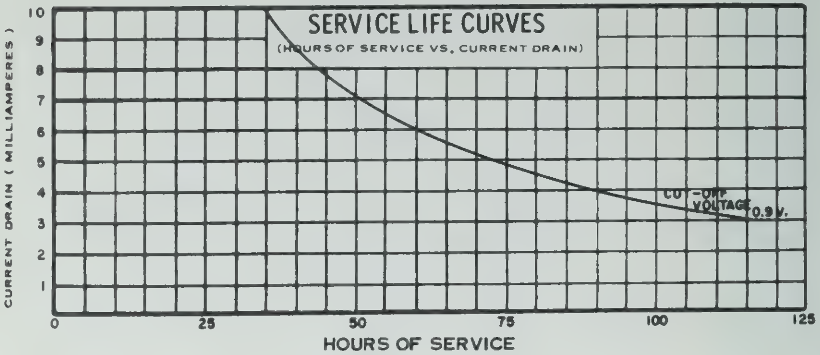
"EVEREADY" NO. E630E

Estimated Service at 70°F.



RESISTANCE VALUES AND EQUIVALENT CURRENT DRAINS AT 1.25 VOLTS

OHMS	MILLIAMPERES
125	10
250	5
417	3



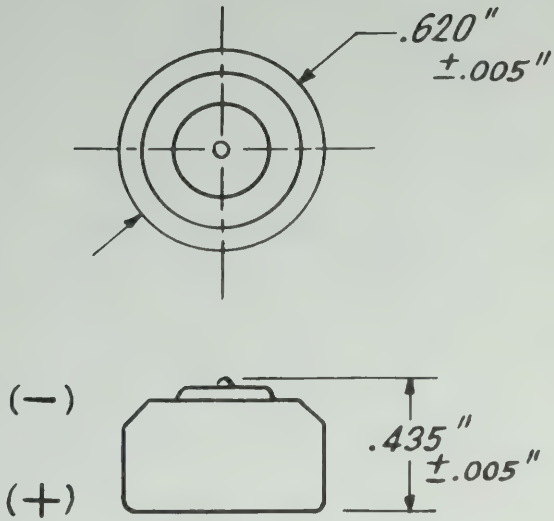
NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E640 CELL

Type — Mercury

NEDA Number — 1105

Suggested Current Range: 0-50 milliamperes



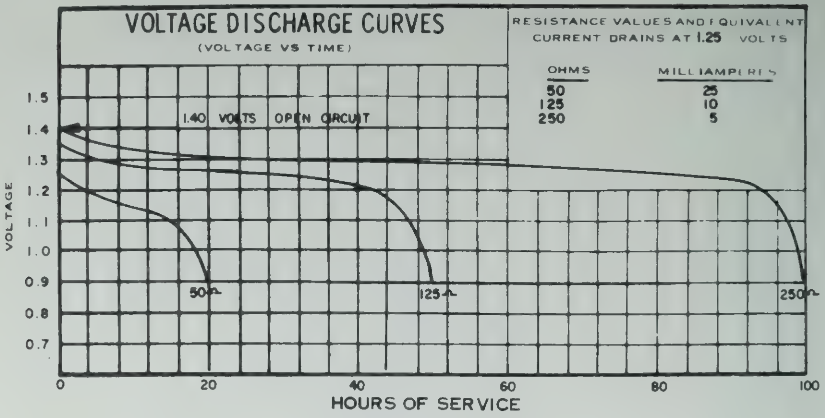
SPECIFICATIONS

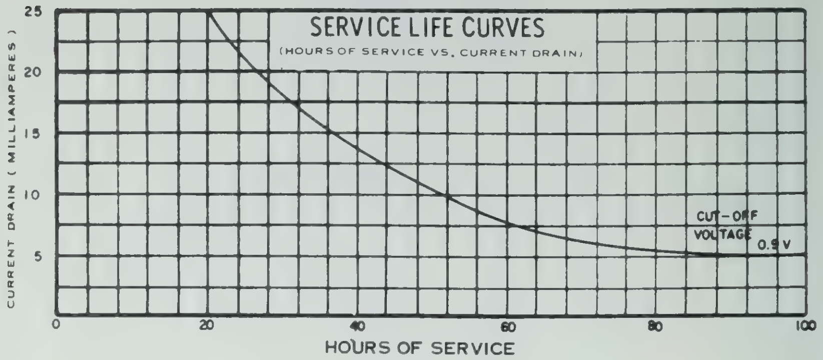
Voltage Taps	−, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 15 milliamperes)	500 milliampere-hours
Terminals	Button
Average Weight	0.38 oz.
Volume	0.13 cubic inches
Cell	One No. 640

For service information see reverse side of this sheet

"EVEREADY" NO. E640

Estimated Service at 70°F.



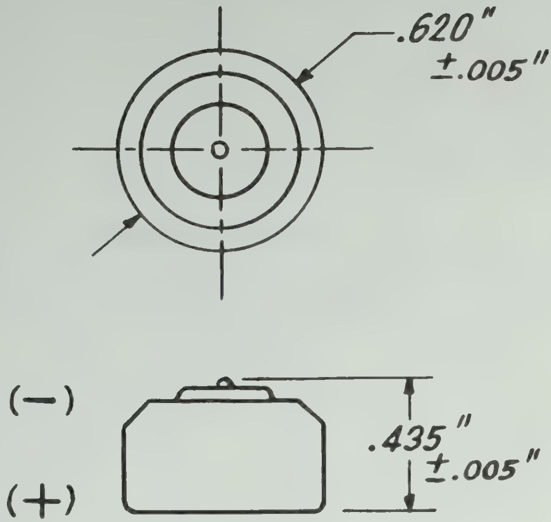


NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E640E CELL

Type — Mercury

Suggested Current Range: 0-50 milliamperes



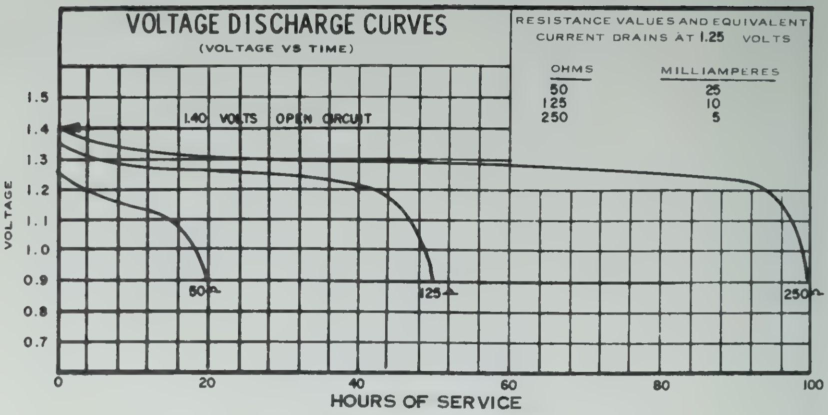
SPECIFICATIONS

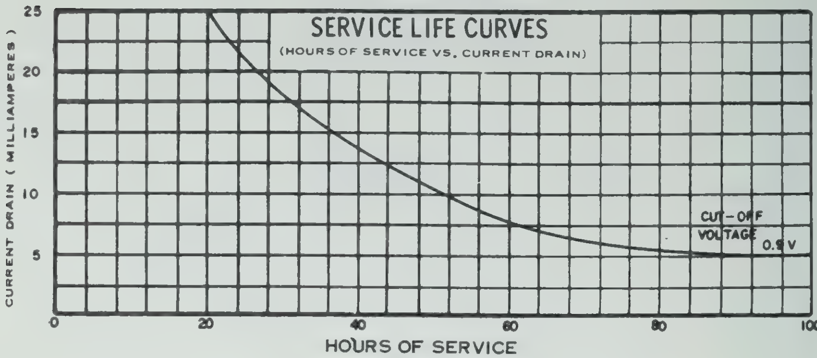
Voltage Taps	−, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 15 milliamperes)	500 milliampere-hours
Terminals	Button
Average Weight	0.38 oz.
Volume	0.13 cubic inches
Cell	One No. 640

For service information see reverse side of this sheet

"EVEREADY" NO. E640E

Estimated Service at 70°F.





NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

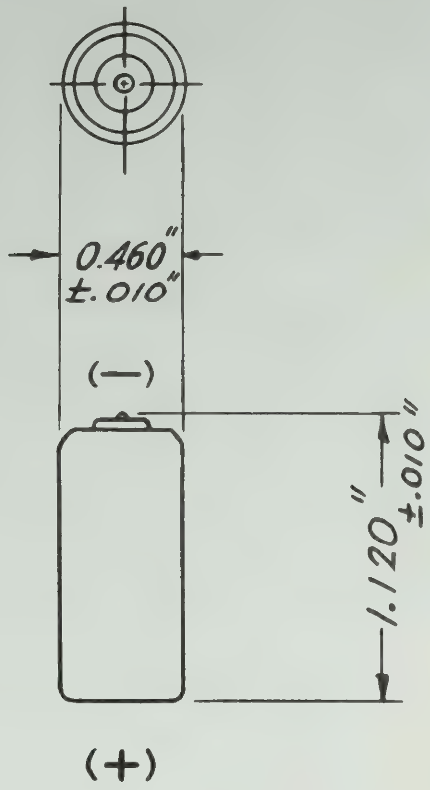
"EVEREADY" NO. E401 CELL

Type — Mercury

ASA Designation — "N"

NEDA Number — 1102

Suggested Current Range: 0-75 milliamperes



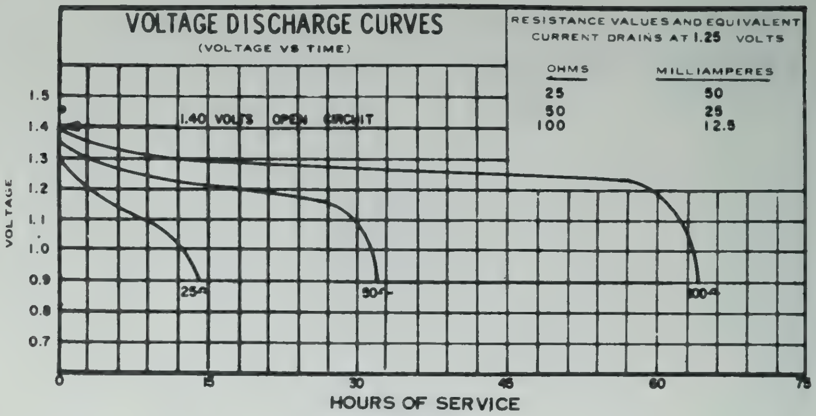
SPECIFICATIONS

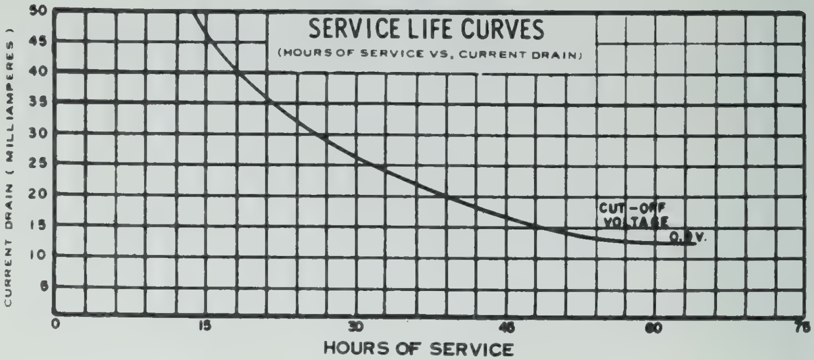
Voltage Taps	–, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 25 milliamperes)	800 milliampere-hours
Terminals	Button
Average Weight	0.40 oz.
Volume	0.18 cubic inches
Cell	One No. 401 (ASA "N")

For service information see reverse side of this sheet

"EVEREADY" NO. E401

Estimated Service at 70°F.





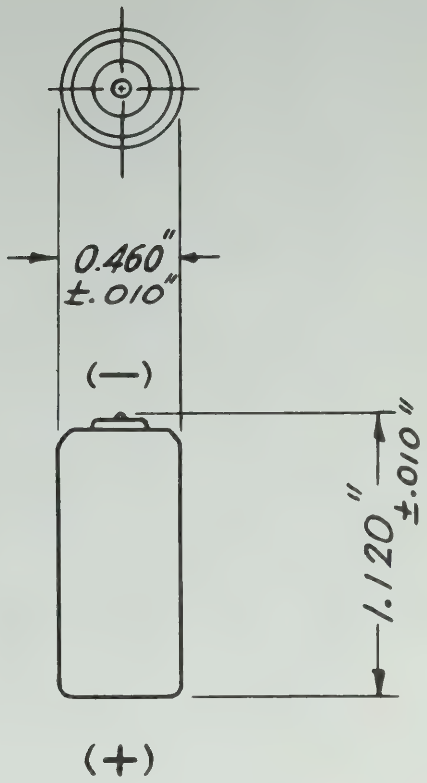
NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E401E CELL

Type—Mercury

ASA Designation—"N"

Suggested Current Range: 0-75 milliamperes



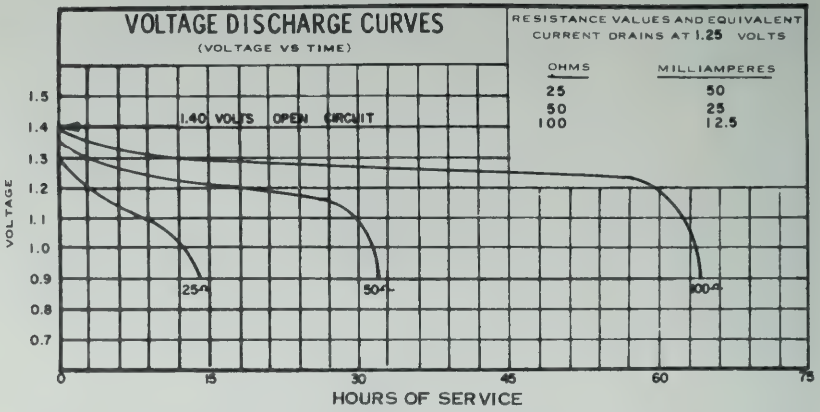
SPECIFICATIONS

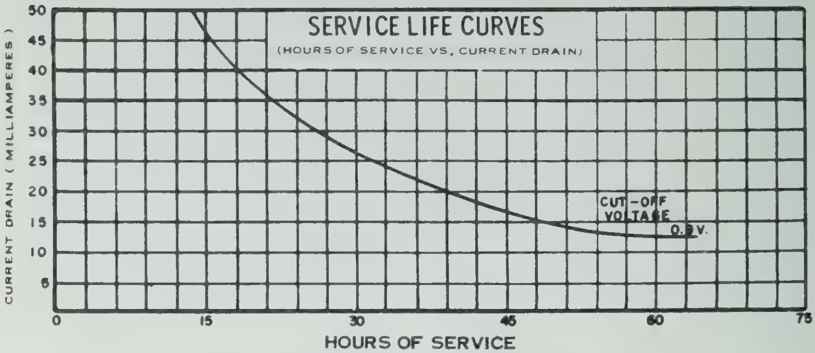
Voltage Taps	—, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 25 milliamperes)	800 milliampere-hours
Terminals	Button
Average Weight	0.40 oz.
Volume	0.18 cubic inches
Cell	One No. 401 (ASA "N")

For service information see reverse side of this sheet

"EVEREADY" NO. E401E

Estimated Service at 70°F



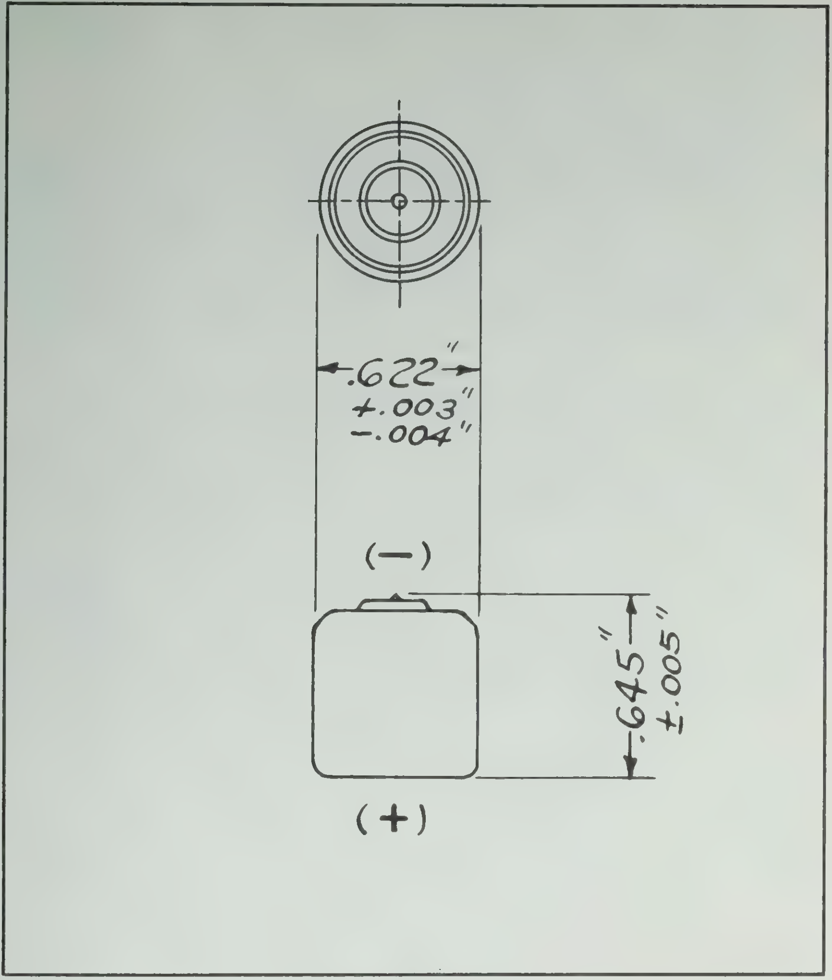


NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E1 CELL

Type—Mercury

Suggested Current Range: 0-100 milliamperes



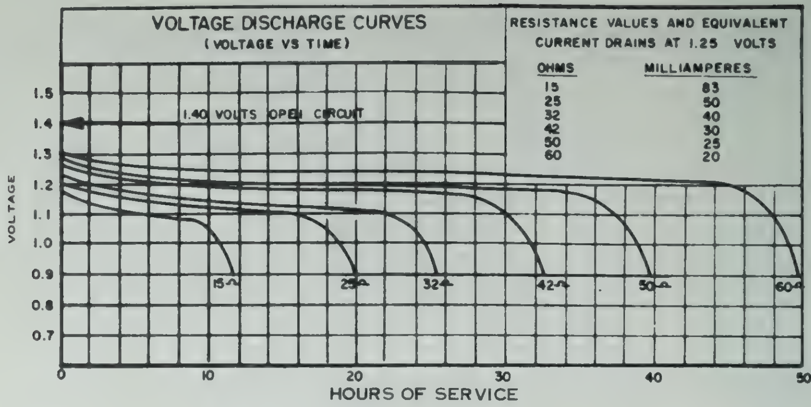
SPECIFICATIONS

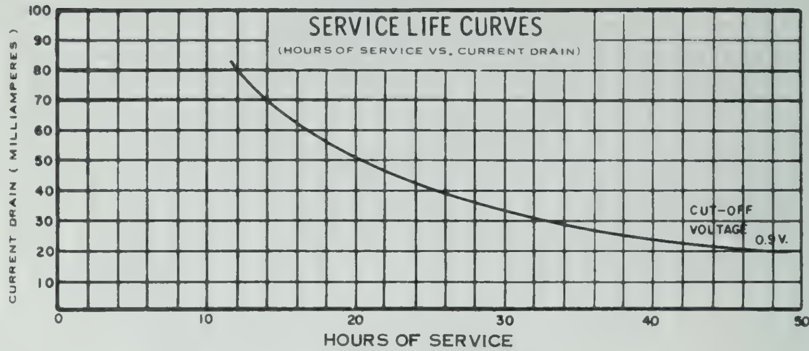
Voltage Taps	—, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 35 milliamperes)	1000 milliampere-hours
Terminals	Button
Average Weight	0.43 oz.
Volume	0.20 cubic inches
Cell	One No. 1

For service information see reverse side of this sheet

"EVEREADY" NO. E1

Estimated Service at 70°F





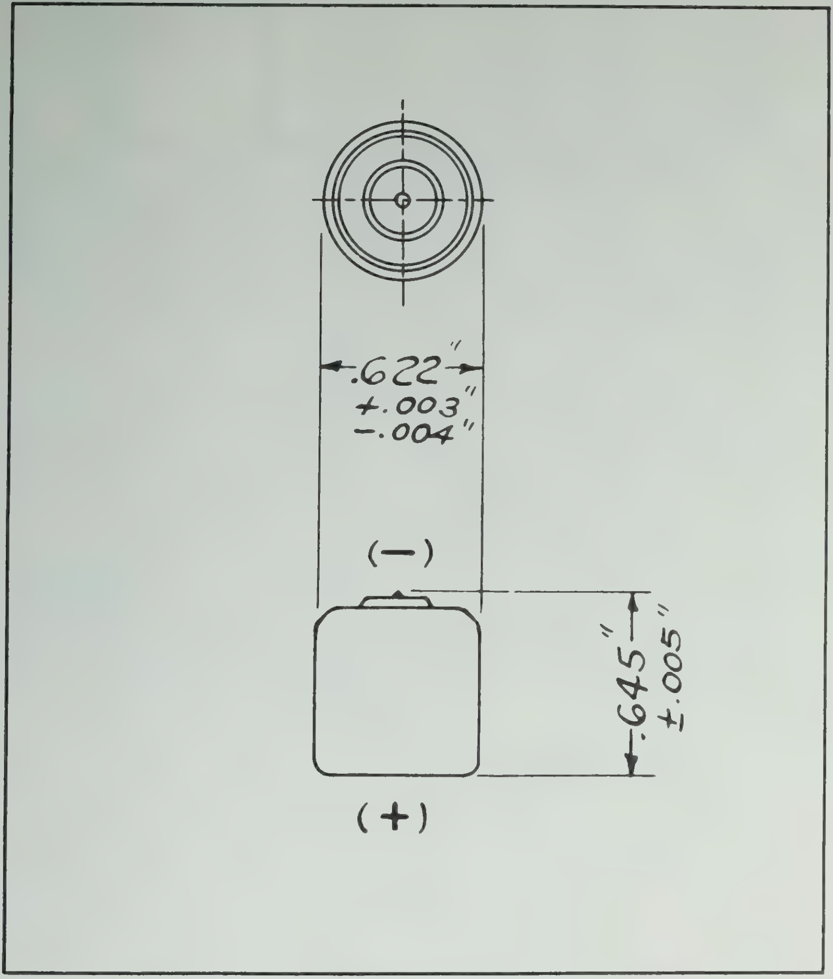
NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

1.40
Volts

"EVEREADY" NO. E1E CELL

Type—Mercury

Suggested Current Range: 0-100 milliamperes



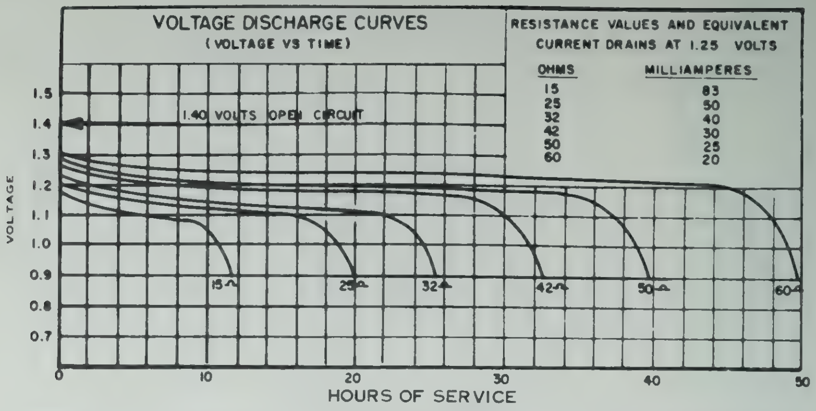
SPECIFICATIONS

Voltage Taps	—, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 35 milliamperes)	1000 milliampere-hours
Terminals	Button
Average Weight	0.43 oz.
Volume	0.20 cubic inches
Cell	One No. 1

For service information see reverse side of this sheet

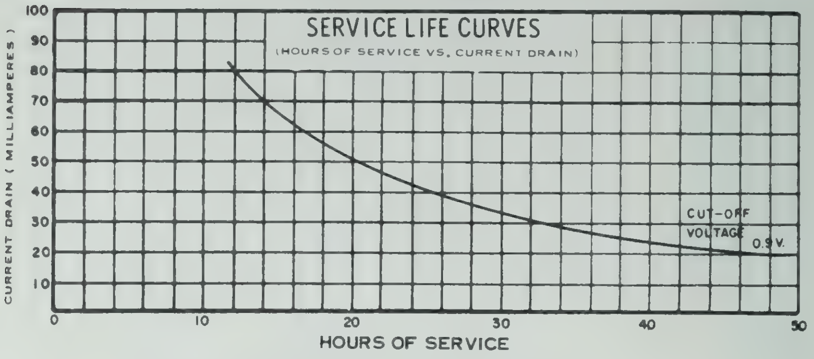
"EVEREADY" NO. E1E

Estimated Service at 70°F



RESISTANCE VALUES AND EQUIVALENT CURRENT DRAINS AT 1.25 VOLTS

OHMS	MILLIAMPERES
15	83
25	50
32	40
42	30
50	25
60	20



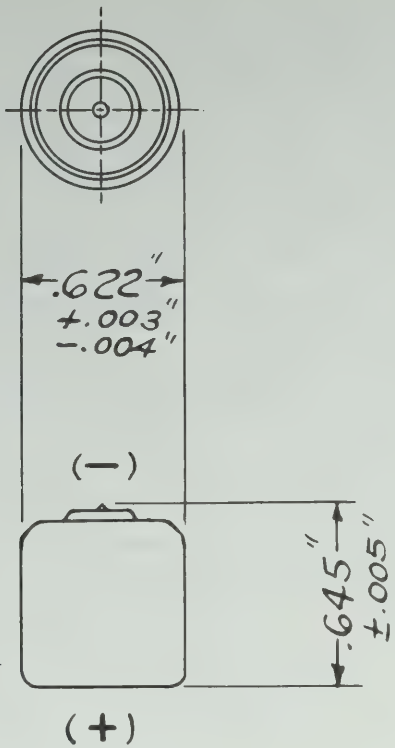
NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E1N CELL

Type — Mercury

NEDA Number — 1100

Suggested Current Range: 0-100 milliamperes



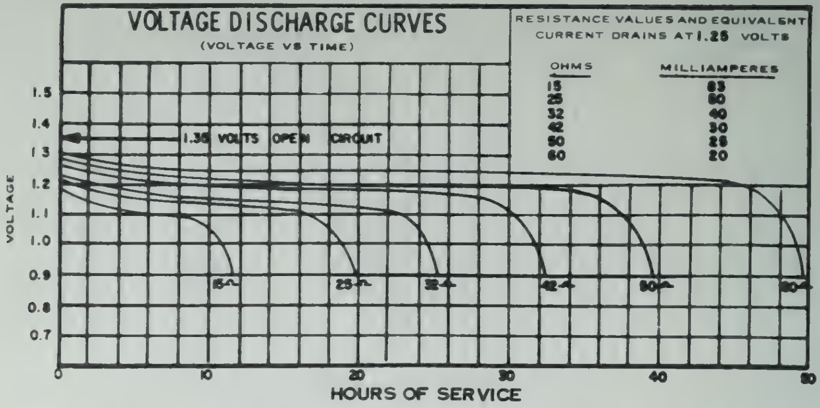
SPECIFICATIONS

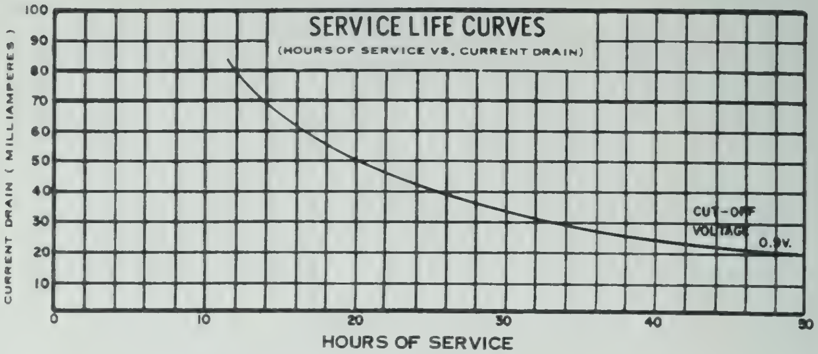
Voltage Taps	−, + 1.35
Service Capacity (to 0.9 volt) (Rated capacity at 35 milliamperes)	1000 milliampere-hours
Terminals	Button
Average Weight	0.43 oz.
Volume	0.20 cubic inches
Cell	One No. 1

For service information see reverse side of this sheet

"EVEREADY" NO. E1N

Estimated Service at 70°F



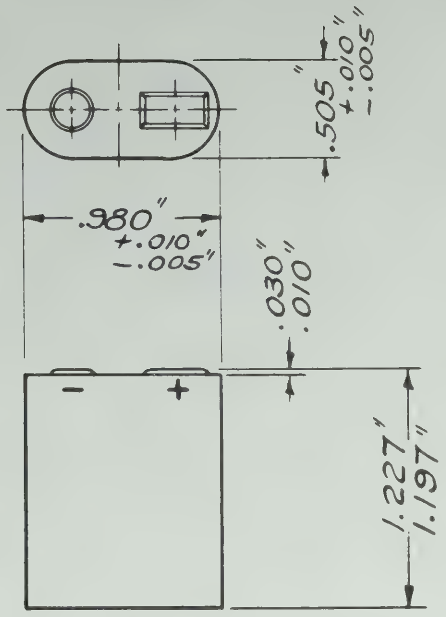


NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E140E BATTERY

Type—Mercury

Suggested Current Range: 0-150 milliamperes



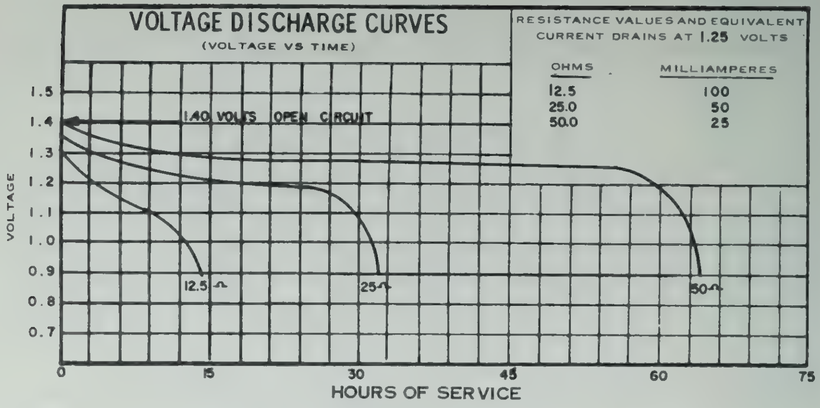
SPECIFICATIONS

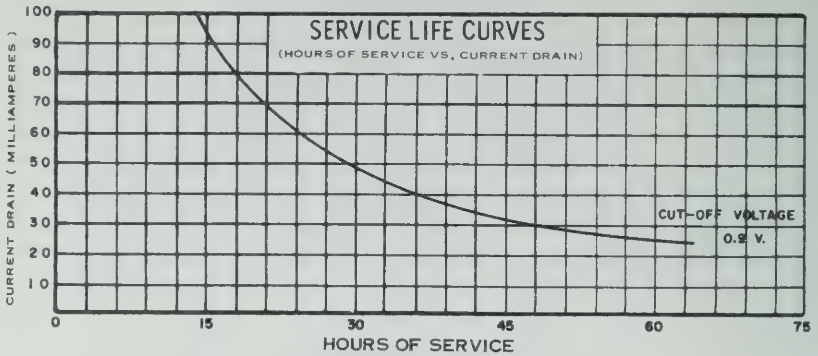
Voltage Taps	−, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 25 milliamperes)	1600 milliampere-hours
Terminals	Button
Average Weight	0.91 oz.
Volume	0.50 cubic inches
Cells	Two No. 401 (ASA "N") in parallel

For service information see reverse side of this sheet

"EVEREADY" NO. E140E

Estimated Service at 70°F



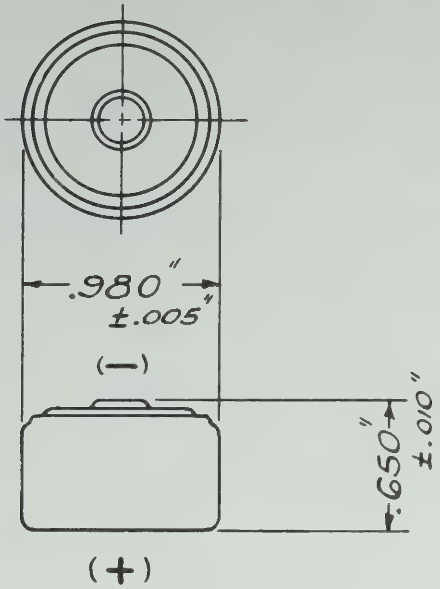


NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E3 CELL

Type—Mercury

Suggested Current Range: 0-60 milliamperes



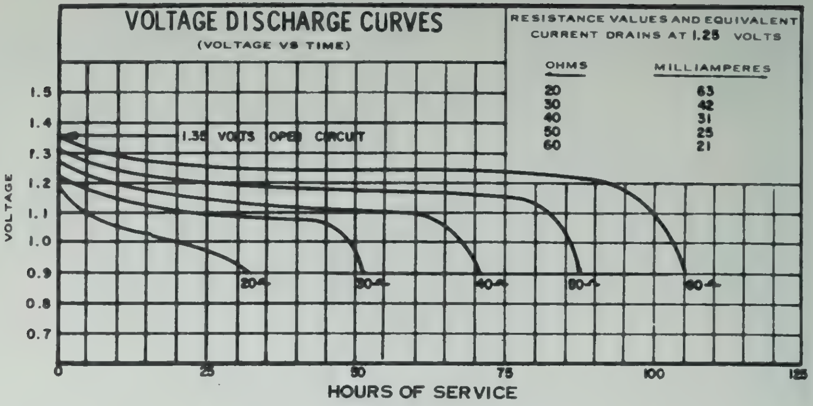
SPECIFICATIONS

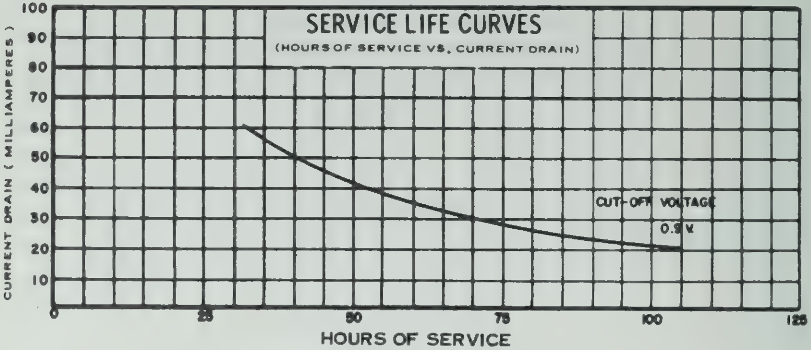
Voltage Taps	—, + 1.35
Service Capacity (to 0.9 volt) (Rated capacity at 42 milliamperes)	2200 milliampere-hours
Terminals	Button
Average Weight	0.93 oz.
Volume	0.50 cubic inches
Cell	One No. 3

For service information see reverse side of this sheet

"EVEREADY" NO. E3

Estimated Service at 70°F





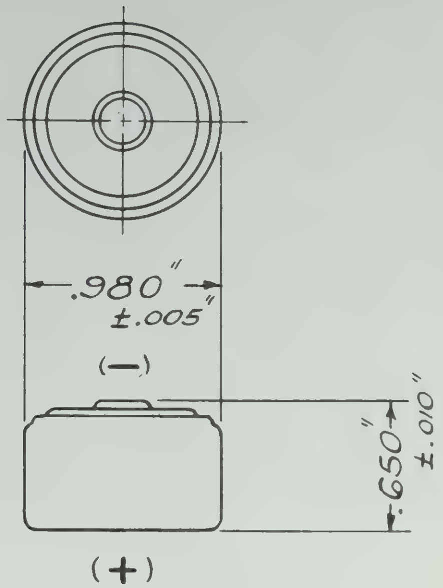
NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

1.40
Volts

"EVEREADY" NO. E3E CELL

Type—Mercury

Suggested Current Range: 0-60 milliamperes



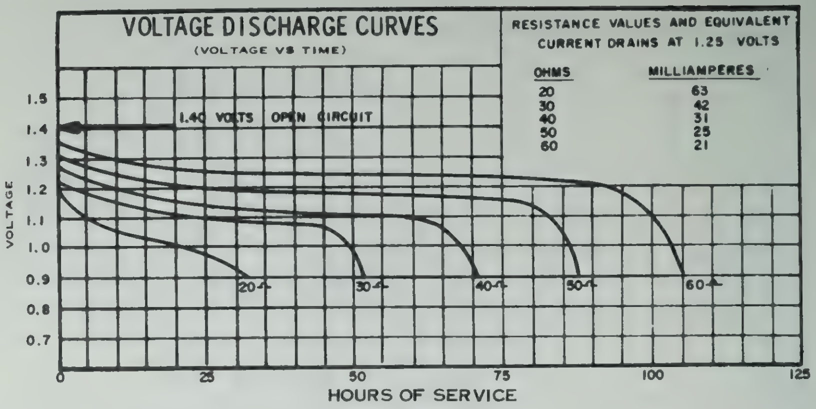
SPECIFICATIONS

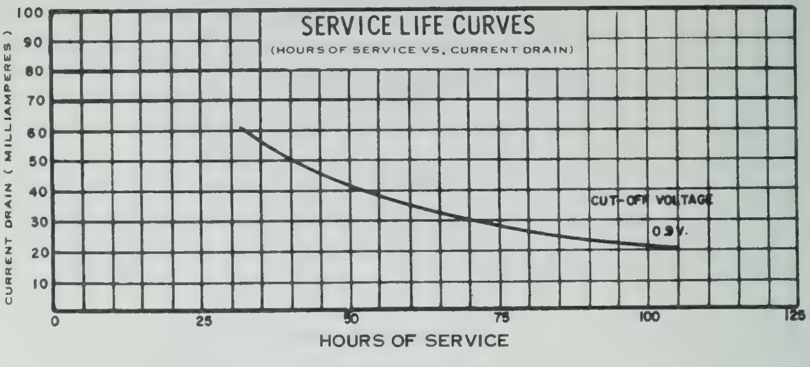
Voltage Taps	—, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 42 milliamperes)	2200 milliampere-hours
Terminals	Button
Average Weight	0.93 oz.
Volume	0.50 cubic inches
Cell	One No. 3

For service information see reverse side of this sheet

"EVEREADY" NO. E3E

Estimated Service at 70°F





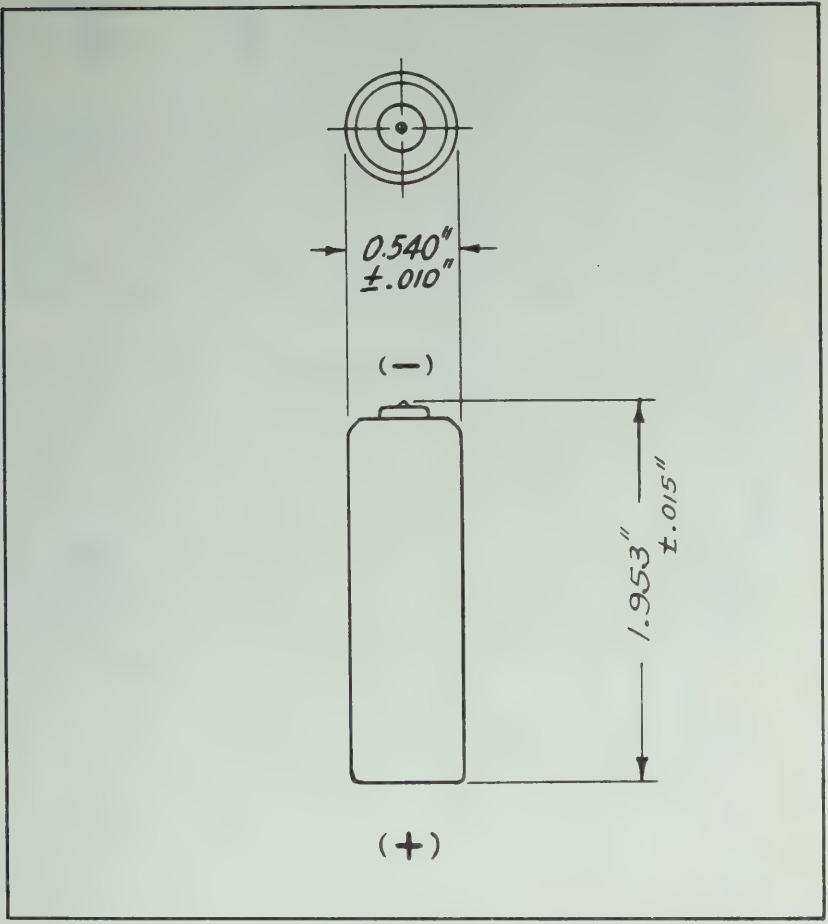
NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E502 CELL

Type—Mercury

ASA Designation—"AA"

Suggested Current Range: 0-200 milliamperes



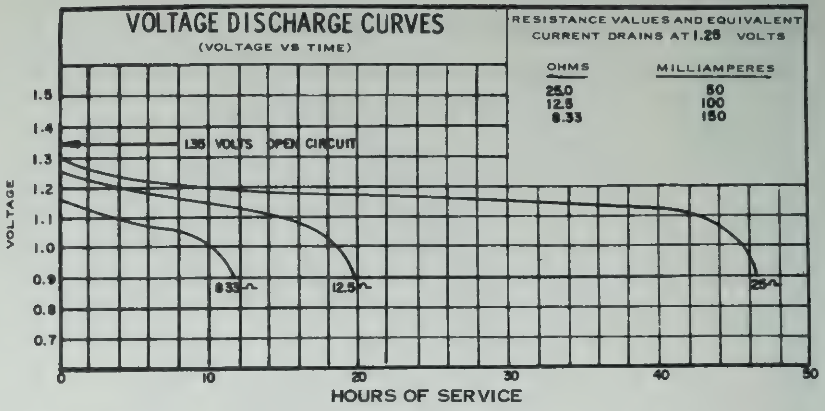
SPECIFICATIONS

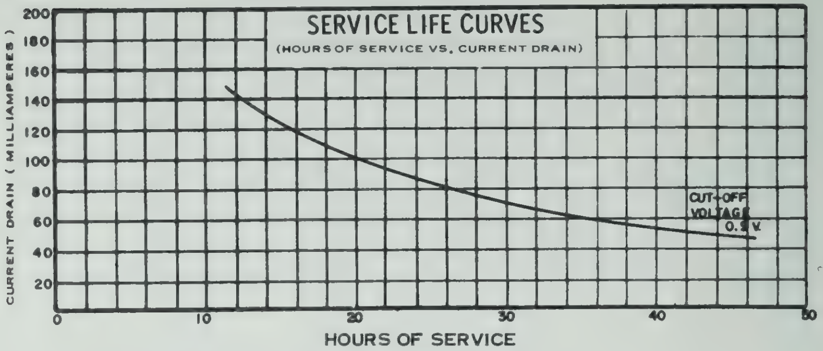
Voltage Taps	−, + 1.35
Service Capacity (to 0.9 volt) (Rated capacity at 50 milliamperes)	2400 milliampere-hours
Terminals	Button
Average Weight	1.05 oz.
Volume	0.44 cubic inches
Cell	One No. 502 (ASA "AA")

For service information see reverse side of this sheet

"EVEREADY" NO. E502

Estimated Service at 70°F





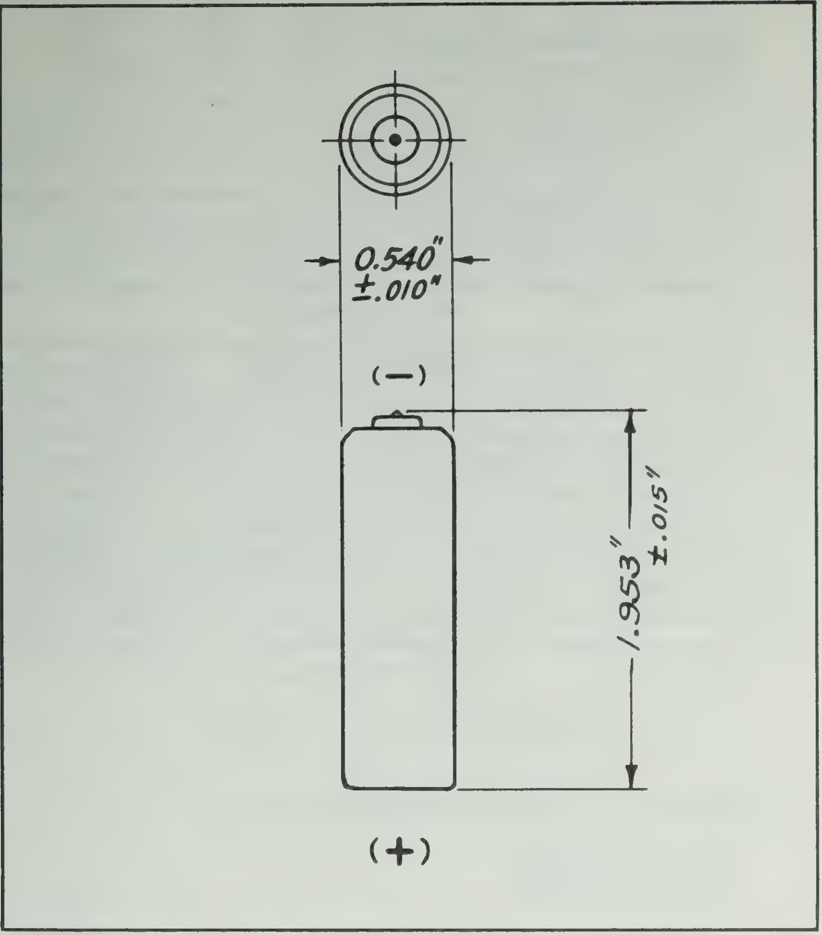
NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E502E CELL

Type—Mercury

ASA Designation—"AA"

Suggested Current Range: 0-200 milliamperes



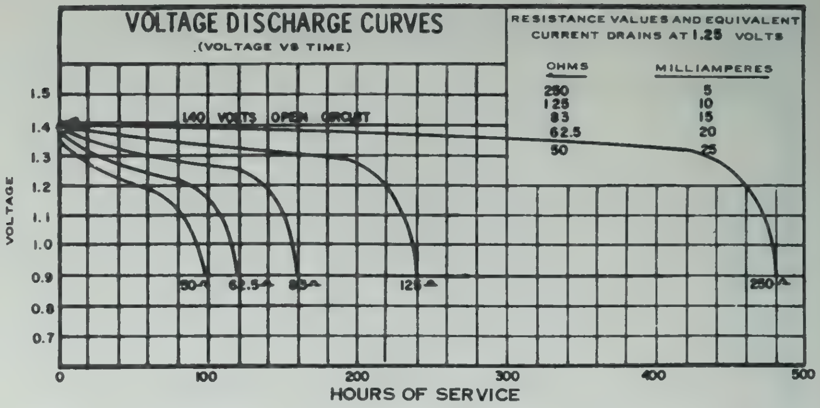
SPECIFICATIONS

Voltage Taps..........−, + 1.40
Service Capacity (to 0.9 volt)..........2400 milliampere-hours
(Rated capacity at 25 milliamperes)
Terminals..........Button
Average Weight..........1.05 oz.
Volume..........0.44 cubic inches
Cell..........One No. 502 (ASA "AA")

For service information see reverse side of this sheet

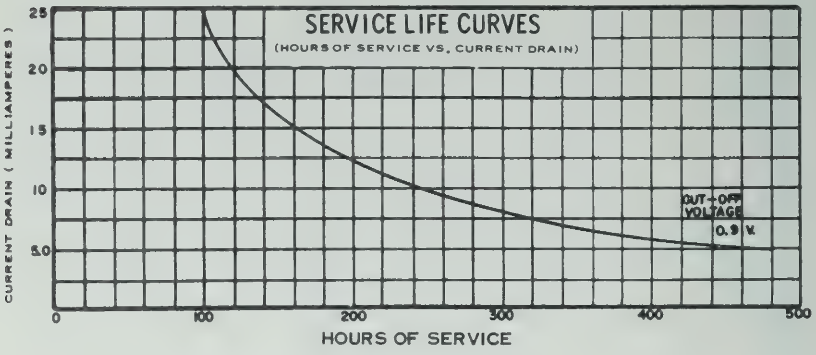
"EVEREADY" NO. E502E

Estimated Service at 70°F



RESISTANCE VALUES AND EQUIVALENT CURRENT DRAINS AT 1.25 VOLTS

OHMS	MILLIAMPERES
250	5
125	10
83	15
62.5	20
50	25

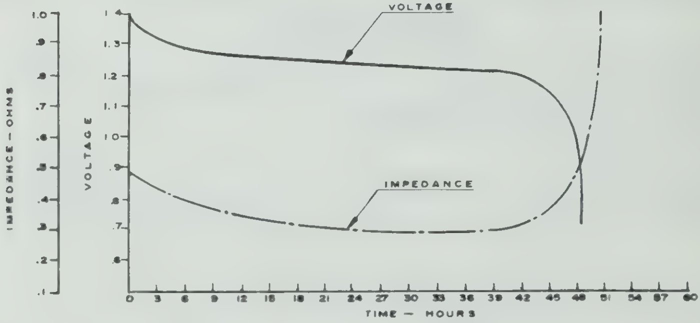


NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

Impedance at 1 KC under 25 Ohm Load (70°F)

THIS IMPEDANCE TAKEN AT THE INDICATED DRAIN.

THIS CURVE IS REPRESENTATIVE OVER THE RANGE OF CURRENT FROM 1 MA TO 200 MA.



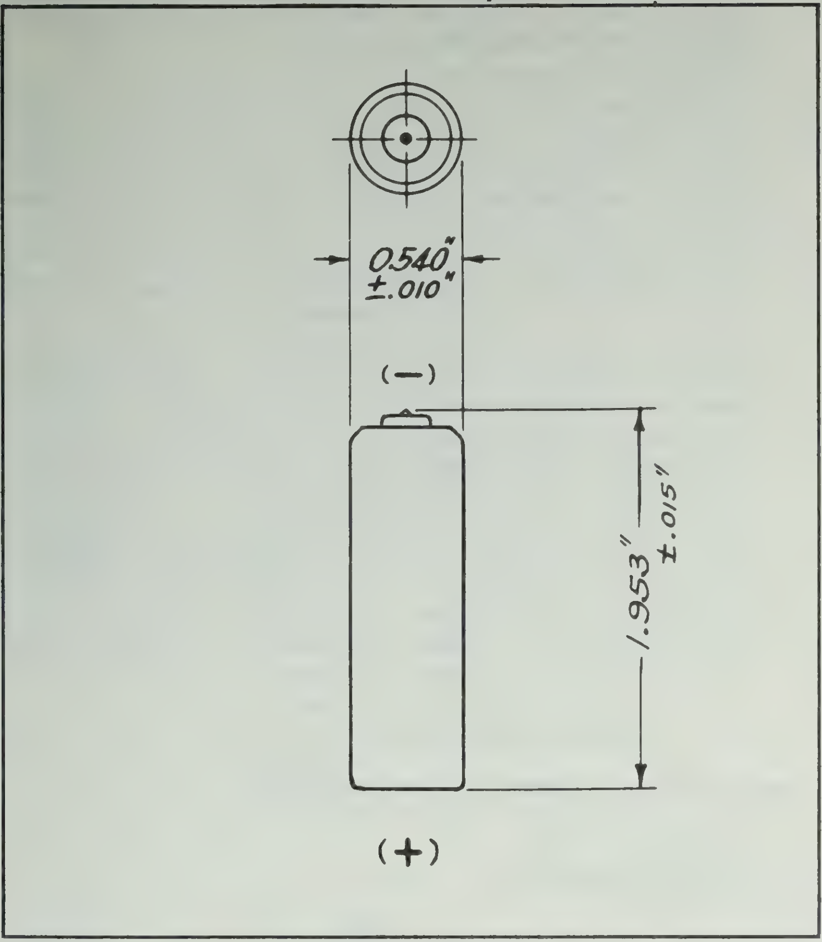
"EVEREADY" NO. E9 CELL

Type — Mercury

ASA Designation — "AA"

NEDA Number — 1103

Suggested Current Range: 0-200 milliamperes



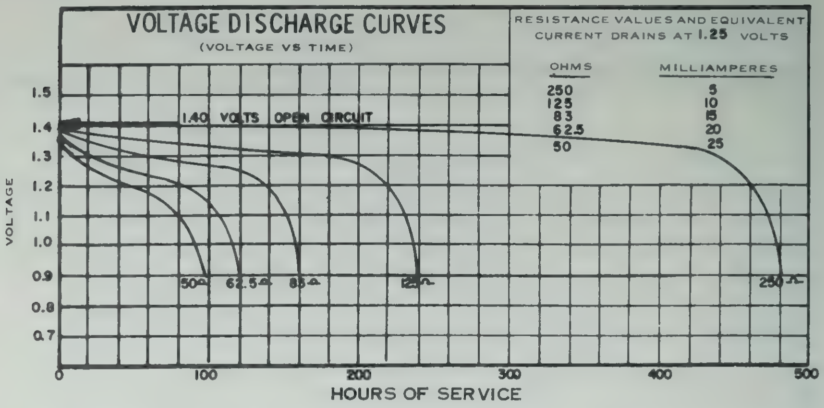
SPECIFICATIONS

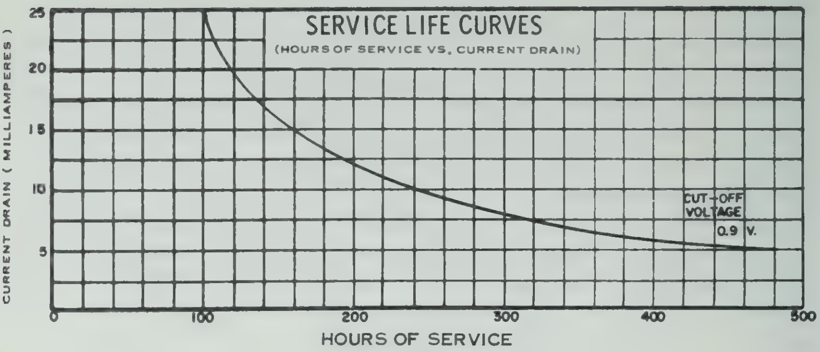
Voltage Taps	—, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 25 milliamperes)	2400 milliampere-hours
Terminals	Button
Average Weight	1.05 oz.
Volume	0.44 cubic inches
Cell	One No. 502 (ASA "AA")

For service information see reverse side of this sheet

"EVEREADY" NO. E9

Estimated Service at 70°F



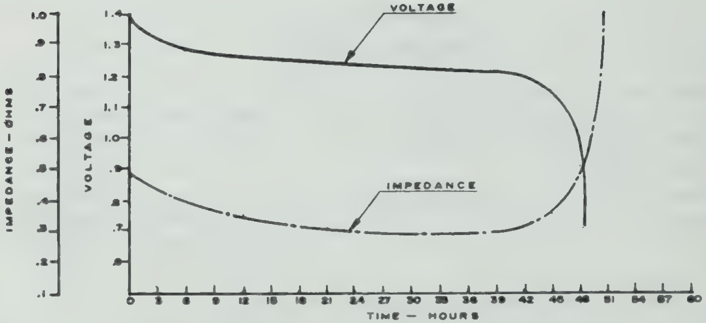


NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

Impedance at 1 KC under 25 Ohm Load (70°F)

THIS IMPEDANCE TAKEN AT THE INDICATED DRAIN.

THIS CURVE IS REPRESENTATIVE OVER THE RANGE OF CURRENT FROM 1 MA TO 200 MA.

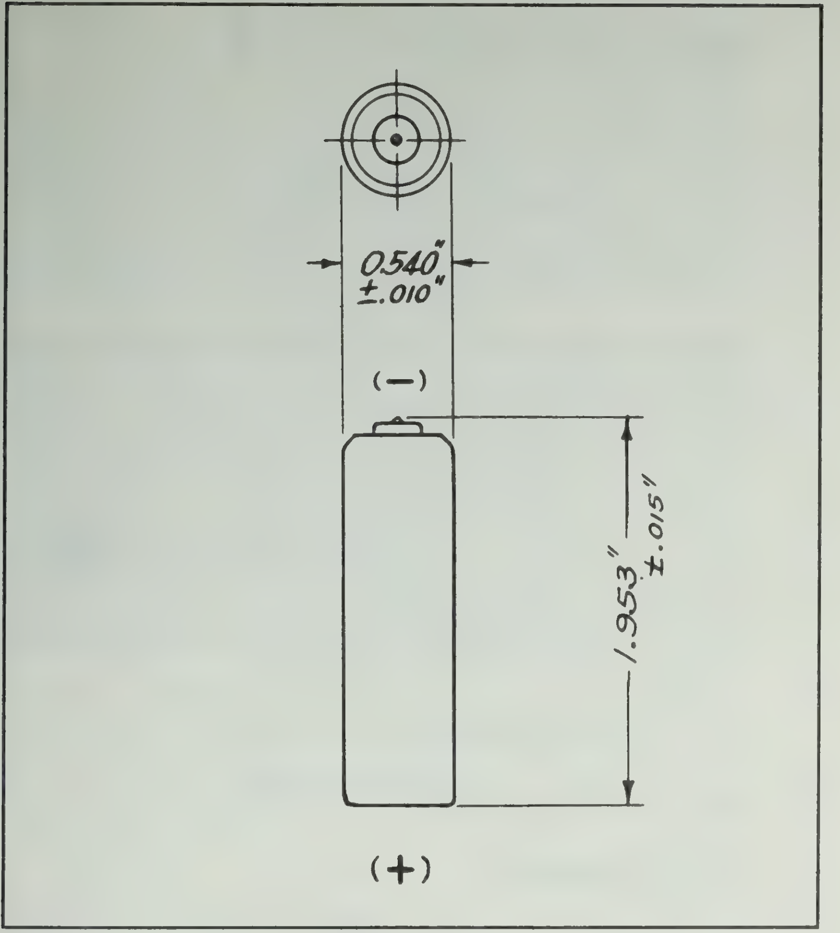


"EVEREADY" NO. E9N CELL

Type—Mercury

ASA Designation—"AA"

Suggested Current Range: 0-200 milliamperes



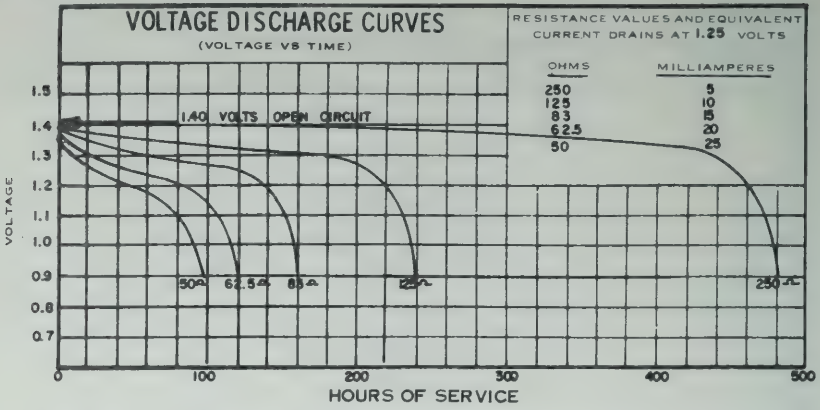
SPECIFICATIONS

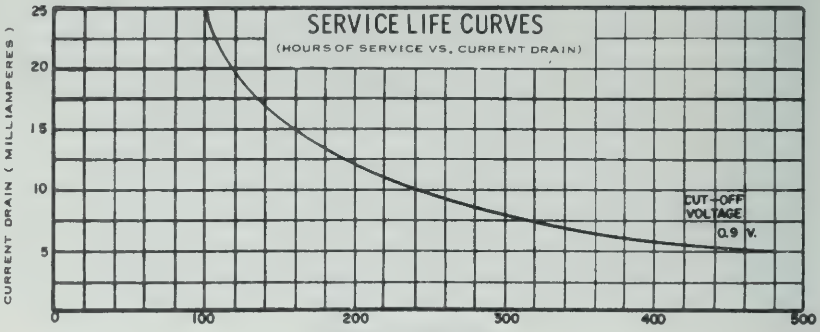
Voltage Taps	—, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 25 milliamperes)	2400 milliampere-hours
Terminals	Button
Average Weight	1.05 oz.
Volume	0.44 cubic inches
Cell	One No. 502 (ASA "AA")

For service information see reverse side of this sheet

"EVEREADY" NO. E9N

Estimated Service at 70°F



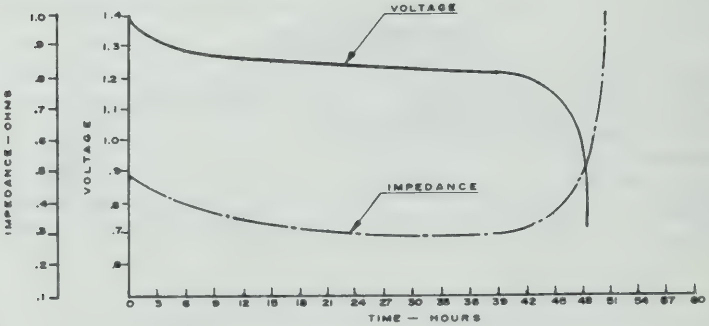


NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

Impedance at 1 KC under 25 Ohm Load (70°F)

THIS IMPEDANCE TAKEN AT THE INDICATED DRAIN.

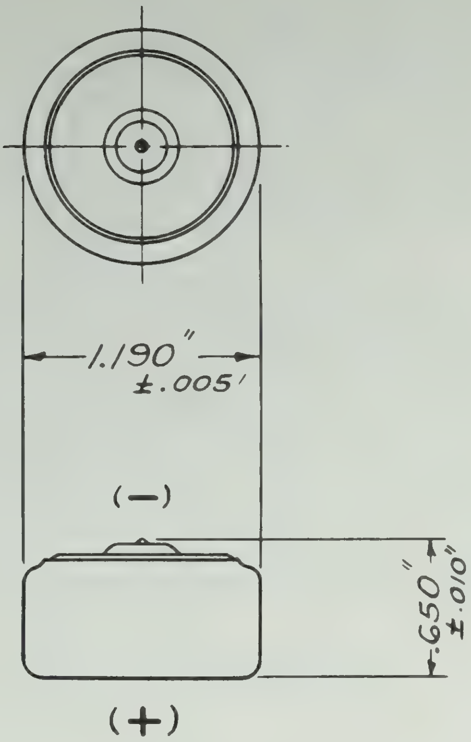
THIS CURVE IS REPRESENTATIVE OVER THE RANGE OF CURRENT FROM 1 MA TO 200 MA.



"EVEREADY" NO. E4 CELL

Type—Mercury

Suggested Current Range: 0-80 milliamperes



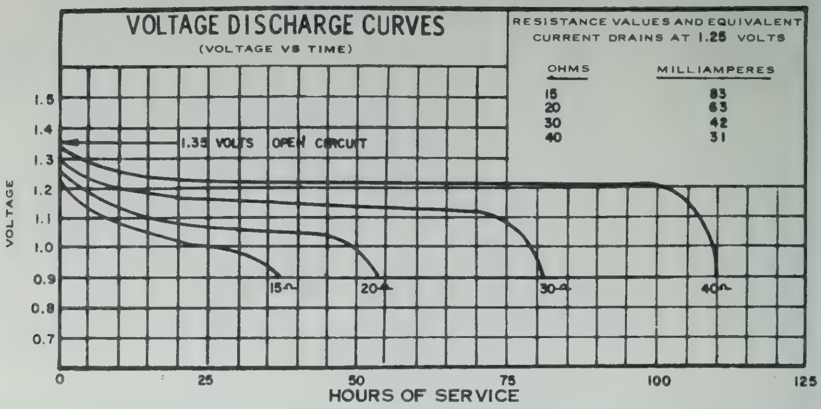
SPECIFICATIONS

Voltage Taps	−, + 1.35
Service Capacity (to 0.9 volt) (Rated capacity at 63 milliamperes)	3400 milliampere-hours
Terminals	Button
Average Weight	1.60 oz.
Volume	0.74 cubic inches
Cell	One No. 4

For service information see reverse side of this sheet

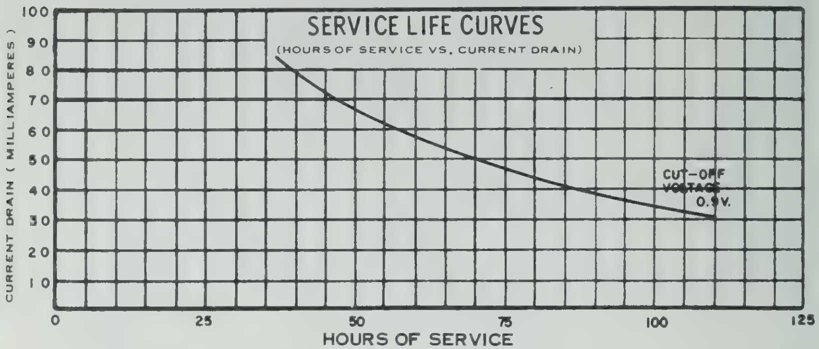
"EVEREADY" NO. E4

Estimated Service at 70°F



RESISTANCE VALUES AND EQUIVALENT CURRENT DRAINS AT 1.25 VOLTS

OHMS	MILLIAMPERES
15	83
20	63
30	42
40	31

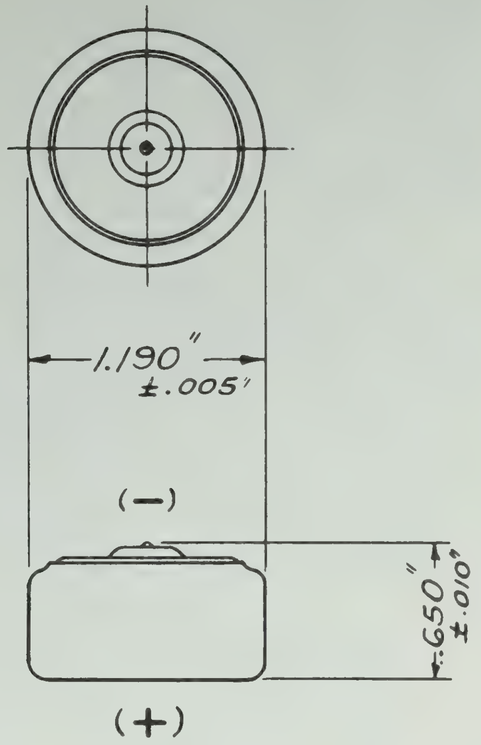


NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E4E CELL

Type—Mercury

Suggested Current Range: 0-80 milliamperes



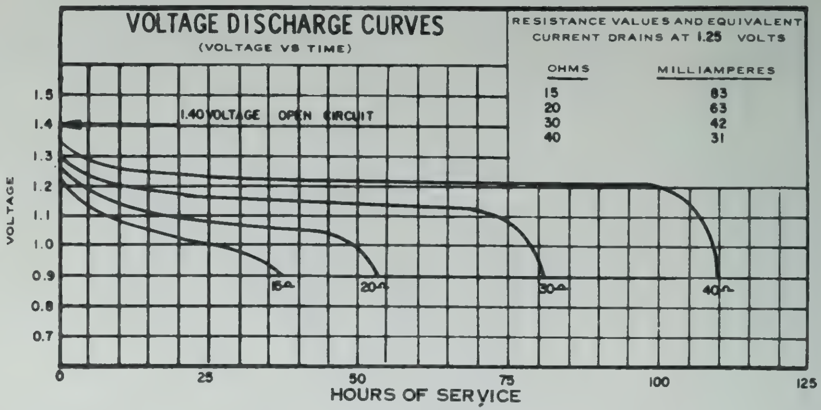
SPECIFICATIONS

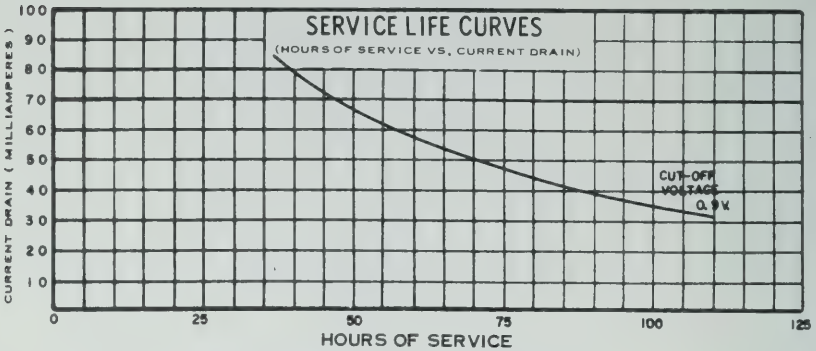
Voltage Taps	−, + 1.40
Service Capacity (to 0.9 volt)	3400 milliampere-hours
(Rated capacity at 63 milliamperes)	
Terminals	Button
Average Weight	1.60 oz.
Volume	0.74 cubic inches
Cell	One No. 4

For service information see reverse side of this sheet

"EVEREADY" NO. E4E

Estimated Service at 70°F





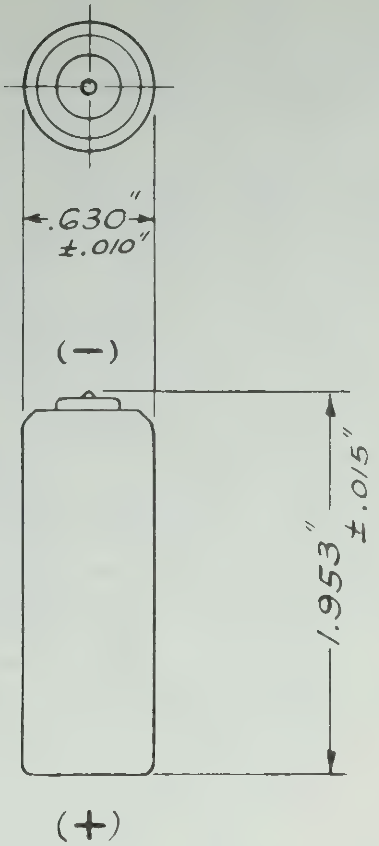
NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E12 CELL

Type—Mercury

ASA Designation—"A"

Suggested Current Range: 0-250 milliamperes



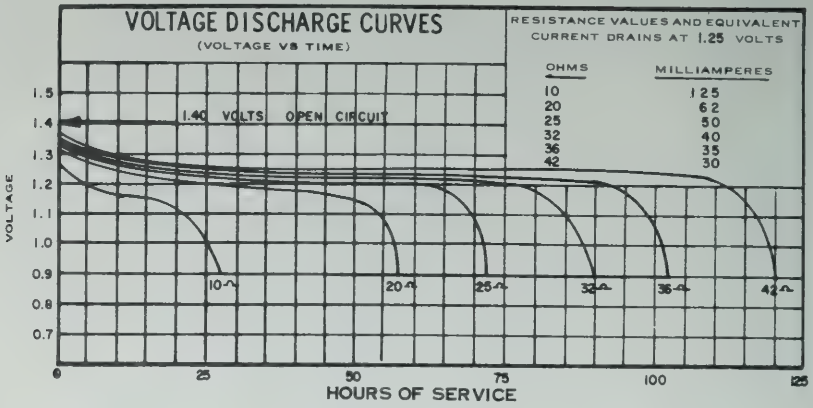
SPECIFICATIONS

Voltage Taps	−, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 62 milliamperes)	3600 milliampere-hours
Terminals	Button
Average Weight	1.40 oz.
Volume	0.60 cubic inches
Cell	One No. 12 (ASA "A")

For service information see reverse side of this sheet

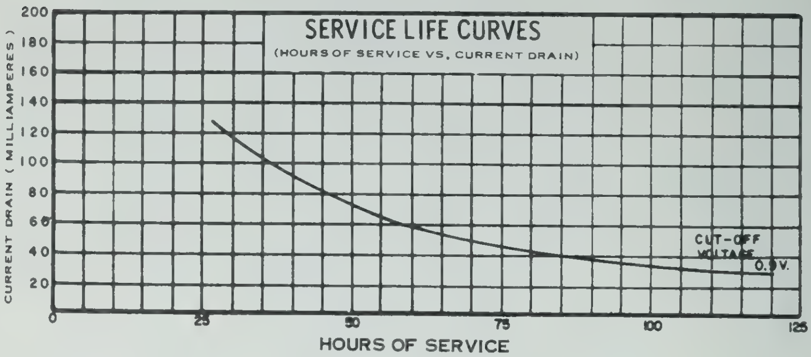
"EVEREADY" NO. E12

Estimated Service at 70°F



RESISTANCE VALUES AND EQUIVALENT CURRENT DRAINS AT 1.25 VOLTS

OHMS	MILLIAMPERES
10	125
20	62
25	50
32	40
36	35
42	30



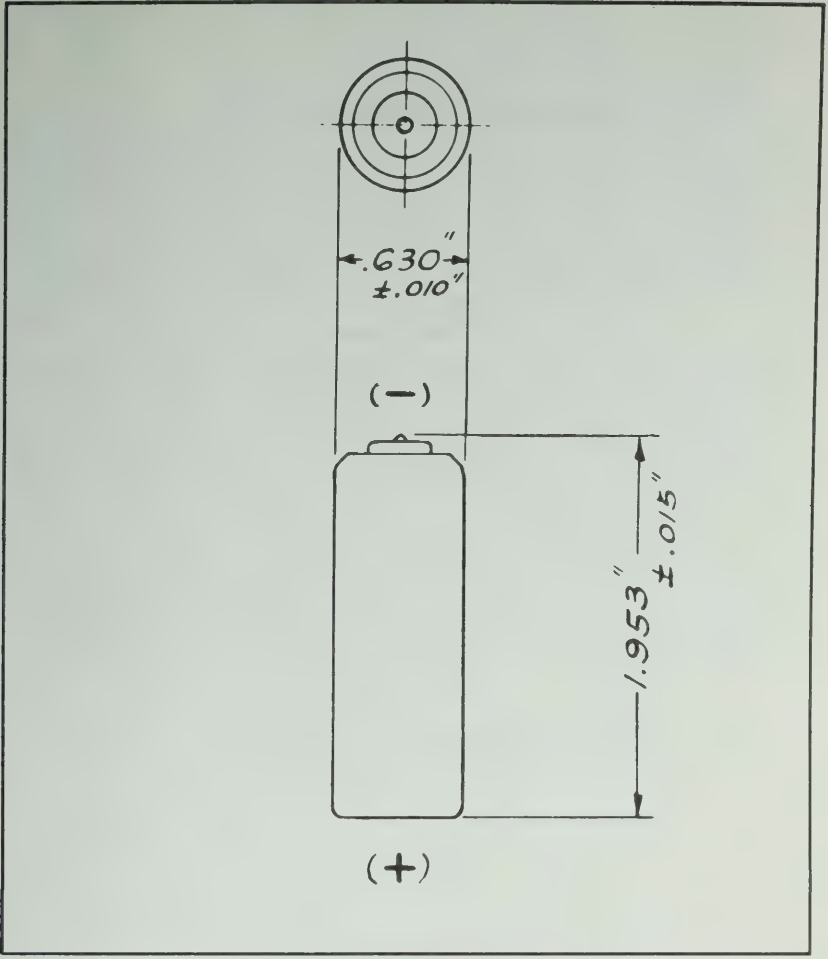
NOTES
CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E12E CELL

Type—Mercury

ASA Designation—"A"

Suggested Current Range: 0-250 milliamperes



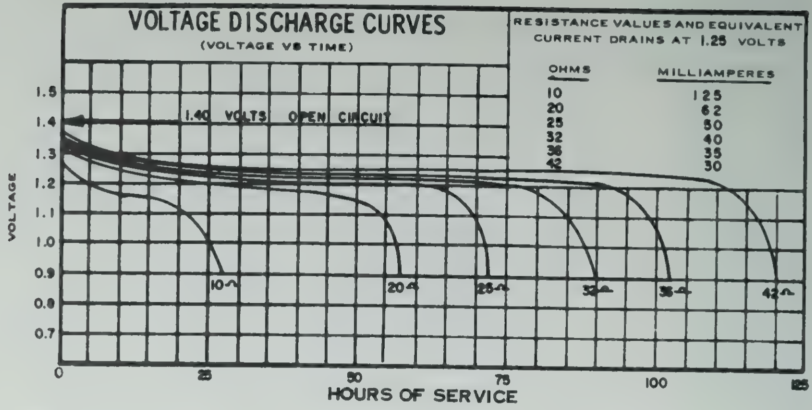
SPECIFICATIONS

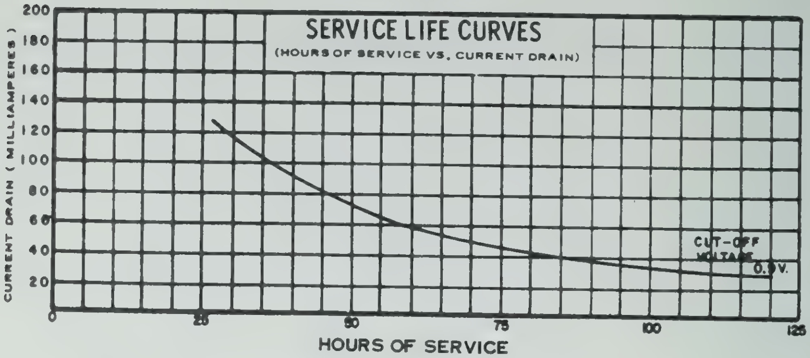
Voltage Taps	−, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 62 milliamperes)	3600 milliampere-hours
Terminals	Button
Average Weight	1.40 oz.
Volume	0.60 cubic inches
Cell	One No. 12 (ASA "A")

For service information see reverse side of this sheet

"EVEREADY" NO. E12E

Estimated Service at 70°F

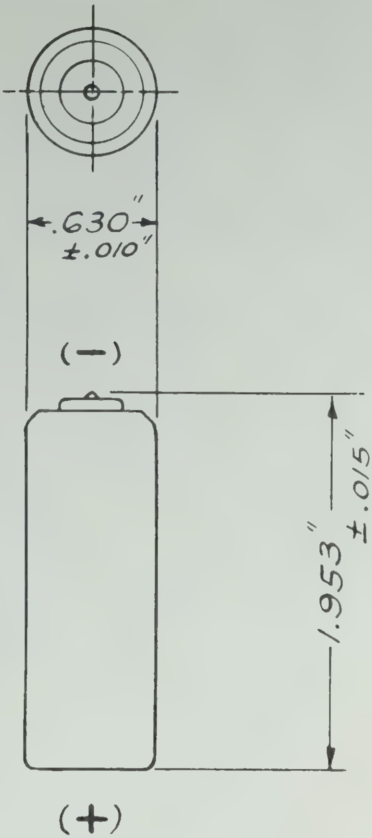




NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E12N CELL

Type — Mercury
ASA Designation — "A"
NEDA Number — 1101
Suggested Current Range: 0-250 milliamperes



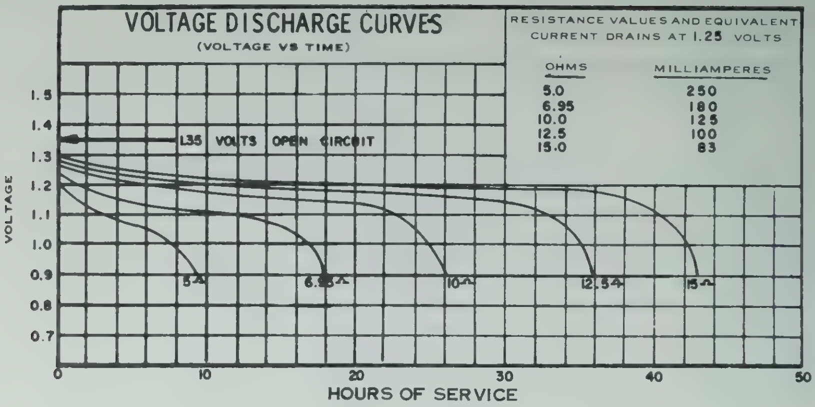
SPECIFICATIONS

Voltage Taps	−, + 1.35
Service Capacity (to 0.9 volt) (Rated capacity at 62 milliamperes)	3600 milliampere-hours
Terminals	Button
Average Weight	1.40 oz.
Volume	0.60 cubic inches
Cell	One No. 12 (ASA "A")

For service information see reverse side of this sheet

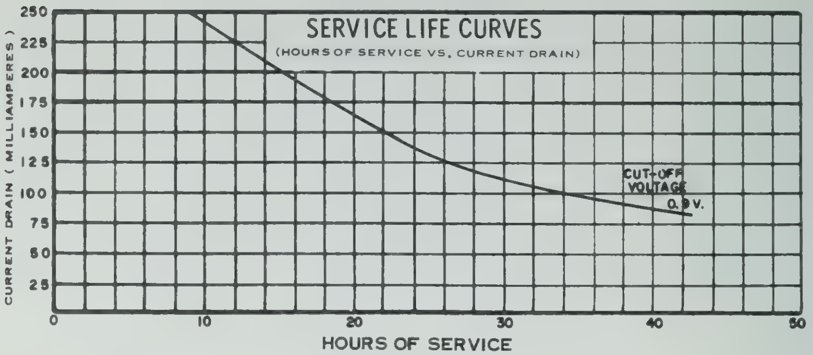
"EVEREADY" NO. E12N

Estimated Service at 70°F



RESISTANCE VALUES AND EQUIVALENT CURRENT DRAINS AT 1.25 VOLTS

OHMS	MILLIAMPERES
5.0	250
6.95	180
10.0	125
12.5	100
15.0	83



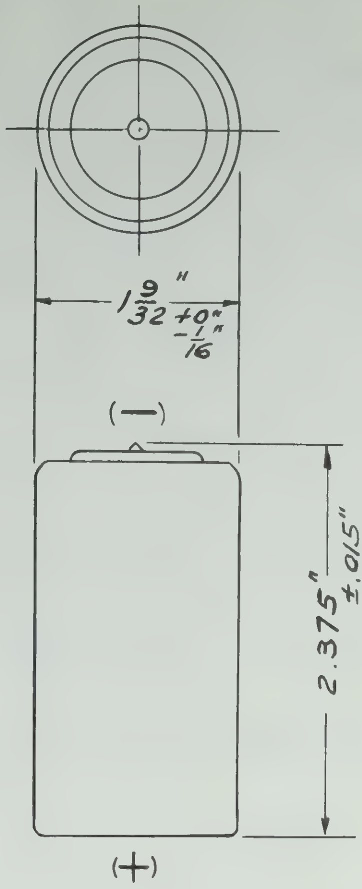
NOTES CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E42 CELL

Type — Mercury

ASA Designation — "D"

Suggested Current Range: 0-1000 milliamperes



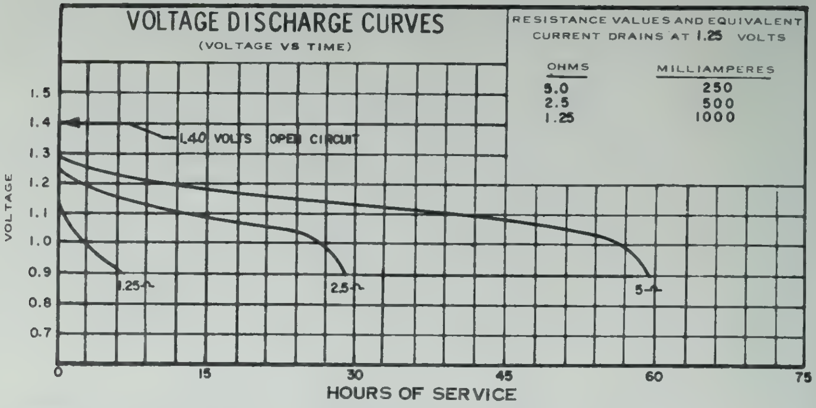
SPECIFICATIONS

Voltage Taps	—, + 1.40
Service Capacity (to 0.9 volt) (Rated capacity at 250 milliamperes)	14,000 milliampere-hours
Terminals	Button
Average Weight	5.85 oz.
Volume	2.90 cubic inches
Cell	One No. 42 (ASA "D")

For service information see reverse side of this sheet

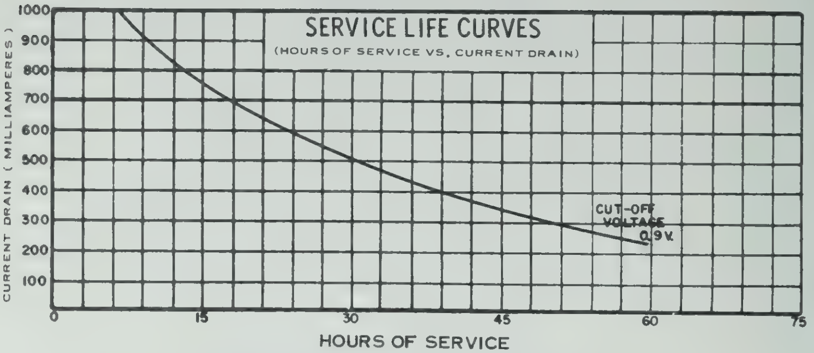
"EVEREADY" NO. E42

Estimated Service at 70°F



RESISTANCE VALUES AND EQUIVALENT CURRENT DRAINS AT 1.25 VOLTS

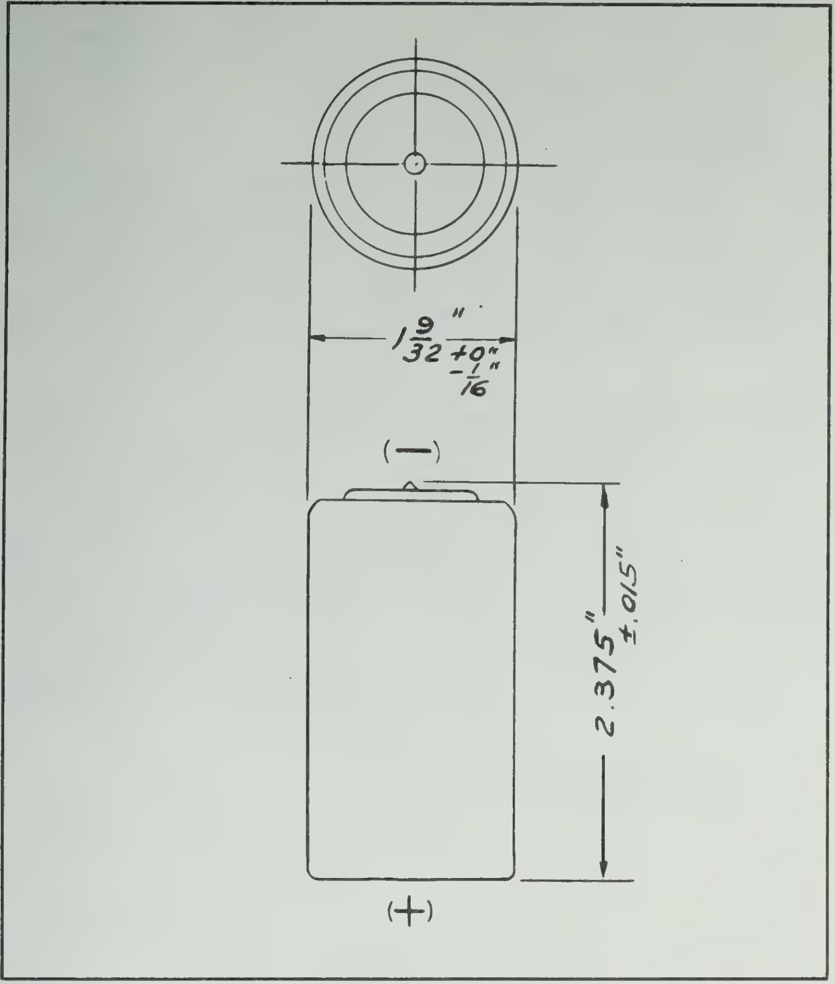
OHMS	MILLIAMPERES
5.0	250
2.5	500
1.25	1000



NOTES
CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E42N CELL

Type — Mercury
ASA Designation — "D"
Suggested Current Range: 0-1000 milliamperes



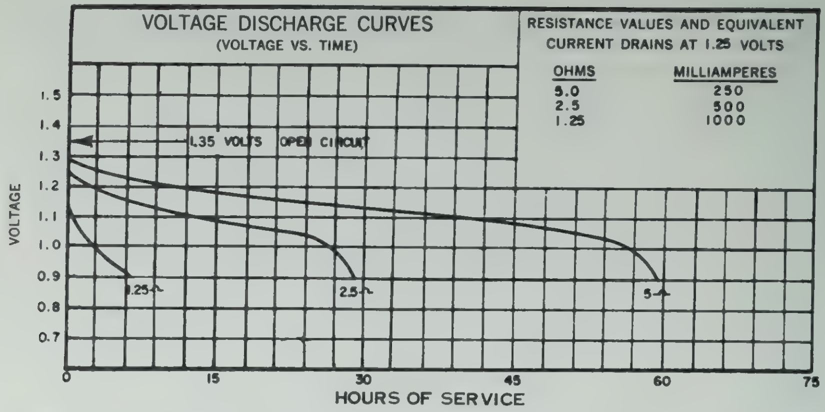
SPECIFICATIONS

Voltage Taps..—, + 1.35
Service Capacity (to 0.9 volt)...................14,000 milliampere-hours
(Rated capacity at 250 milliamperes)
Terminals ....Button
Average Weight ....5.85 oz.
Volume ....2.90 cubic inches
Cell..One No. 42 (ASA "D")

For service information see reverse side of this sheet

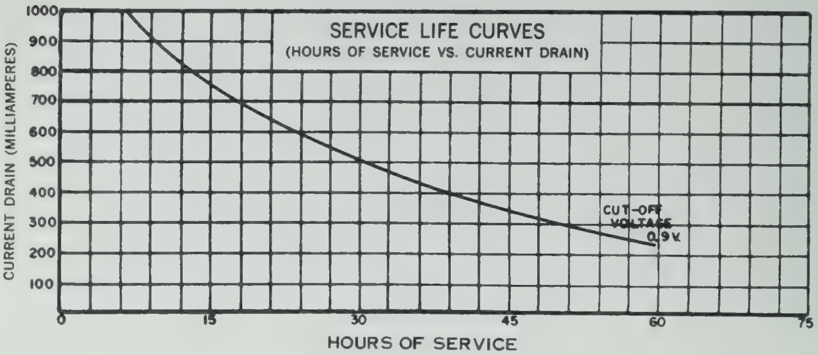
"EVEREADY" NO. E42N

Estimated Service at 70°F


VOLTAGE DISCHARGE CURVES
(VOLTAGE VS. TIME)

RESISTANCE VALUES AND EQUIVALENT CURRENT DRAINS AT 1.25 VOLTS

OHMS	MILLIAMPERES
5.0	250
2.5	500
1.25	1000

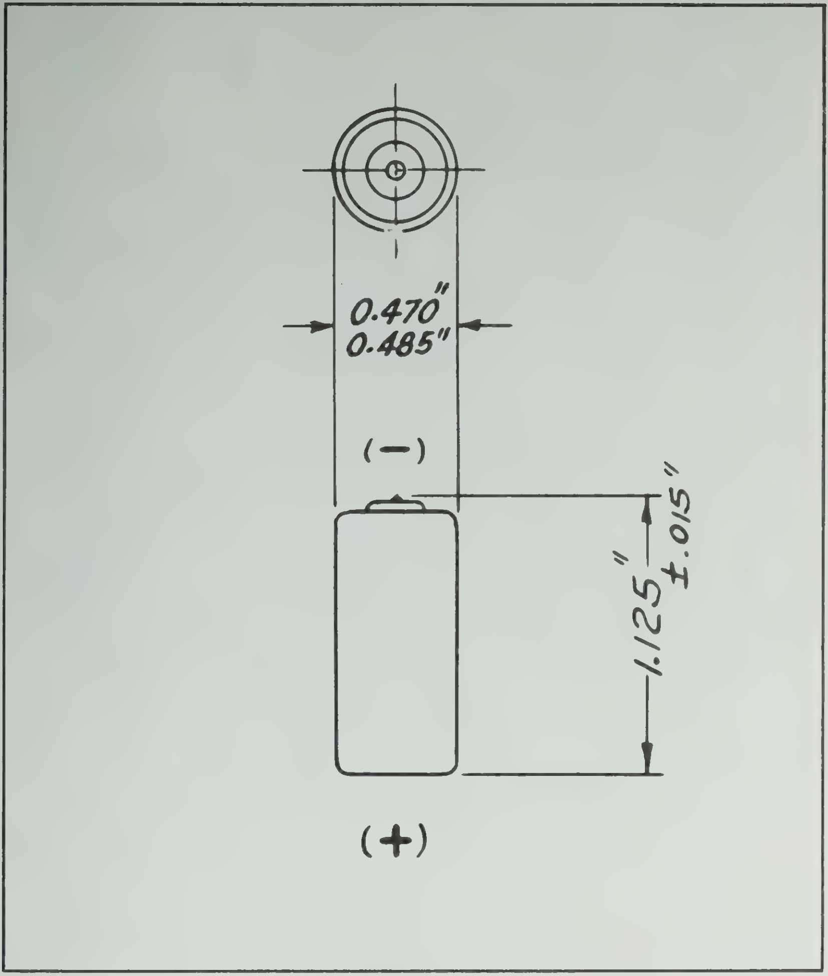

SERVICE LIFE CURVES
(HOURS OF SERVICE VS. CURRENT DRAIN)

NOTES: CURRENT DRAIN VALUES DETERMINED AT 1.25 VOLTS
INDICATED PERFORMANCE AT 70° F.
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E152E BATTERY

Type—Mercury

Suggested Current Range: 0-30 milliamperes



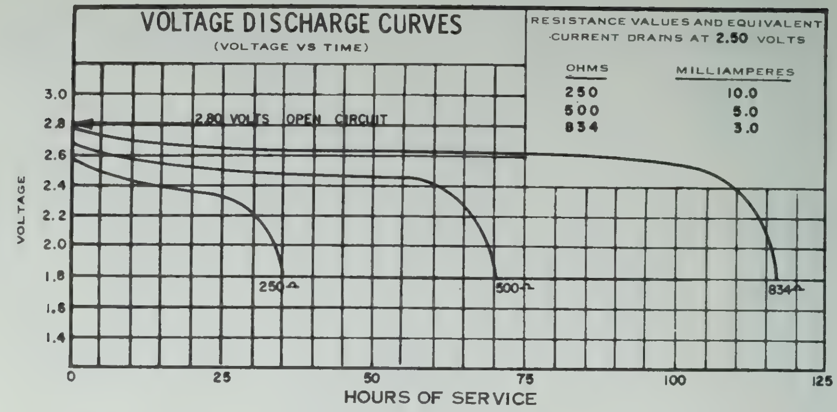
SPECIFICATIONS

Voltage Taps	−, + 2.80
Service Capacity (to 1.8 volts) (Rated capacity at 3 milliamperes)	350 milliampere-hours
Terminals	Button
Average Weight	0.42 oz.
Volume	0.19 cubic inches
Cell	Two No. 450 in series

For service information see reverse side of this sheet

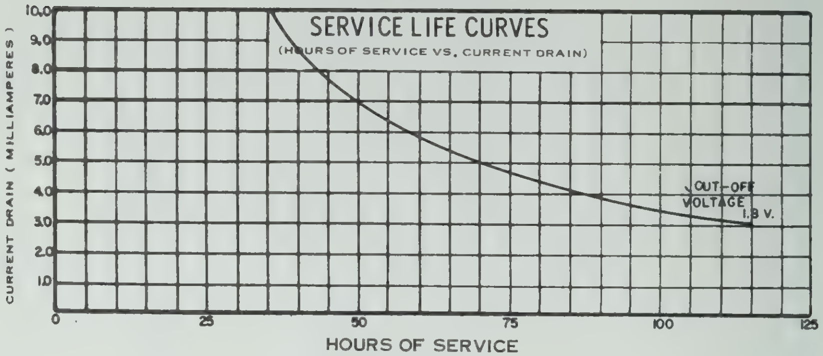
"EVEREADY" NO. E152E

Estimated Service at 70°F



RESISTANCE VALUES AND EQUIVALENT CURRENT DRAINS AT 2.50 VOLTS

OHMS	MILLIAMPERES
250	10.0
500	5.0
834	3.0

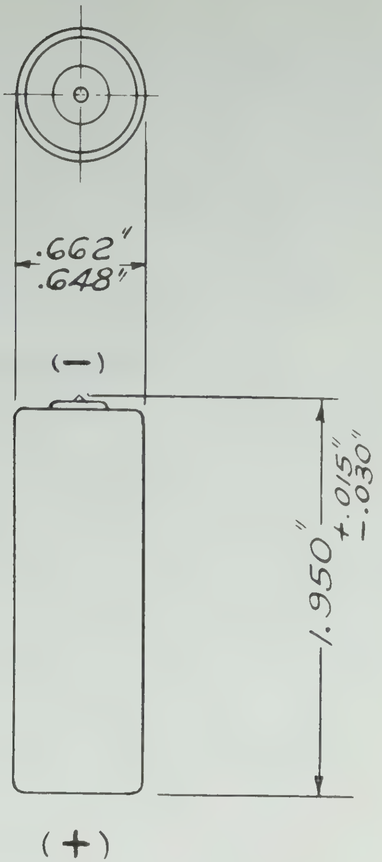


NOTES CURRENT DRAIN VALUES DETERMINED AT 2.50 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E132B BATTERY

Type—Mercury

Suggested Current Range: 0-100 milliamperes



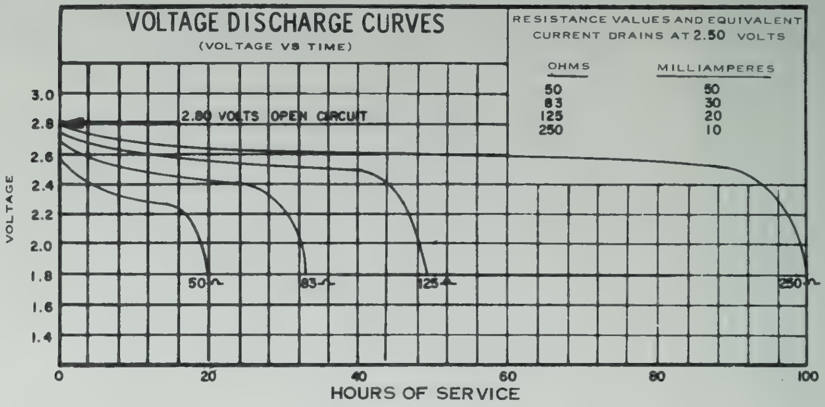
SPECIFICATIONS

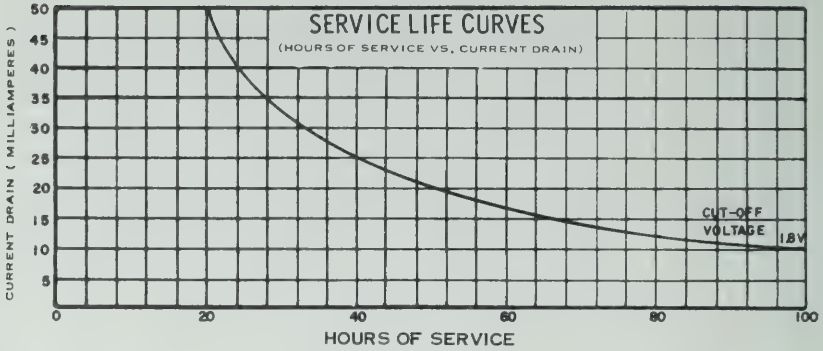
Voltage Taps	—, + 2.80
Service Capacity (to 1.8 volts) (Rated capacity at 35 milliamperes)	1000 milliampere-hours
Terminals	Button
Average Weight	1.10 oz.
Volume	0.65 cubic inches
Cells	Two No. 1 in series & One Dummy

For service information see reverse side of this sheet

"EVEREADY" NO. E132B

Estimated Service at 70°F



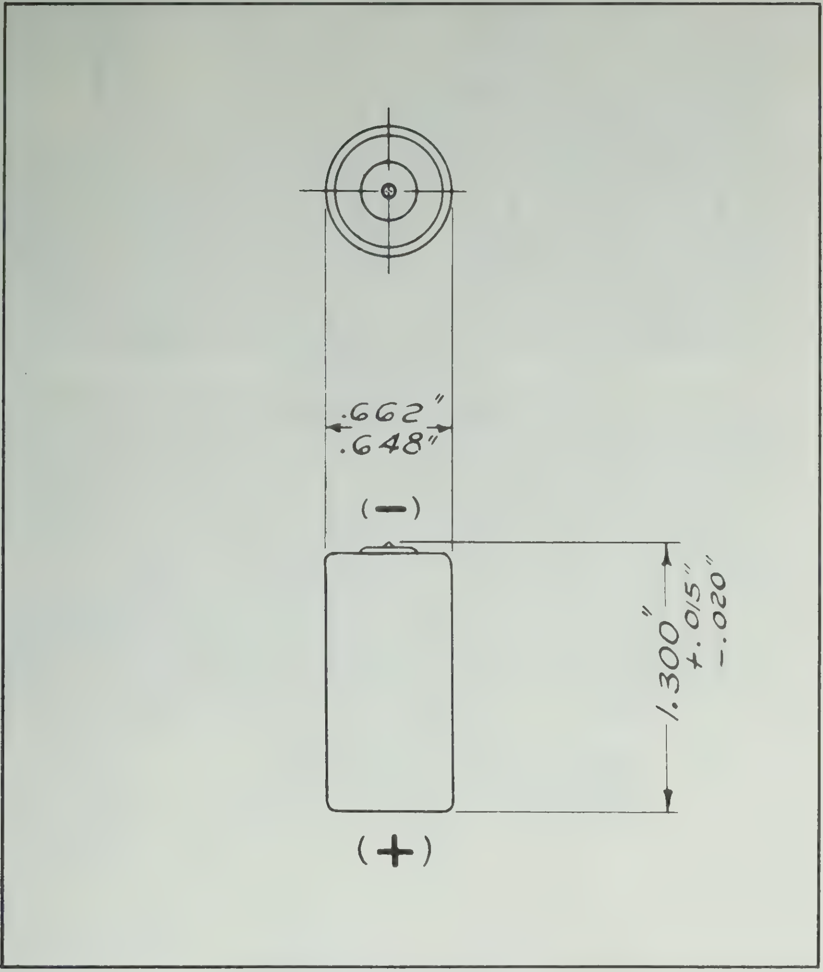


NOTES CURRENT DRAIN VALUES DETERMINED AT 2.50 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E132E BATTERY

Type—Mercury

Suggested Current Range: 0-100 milliamperes



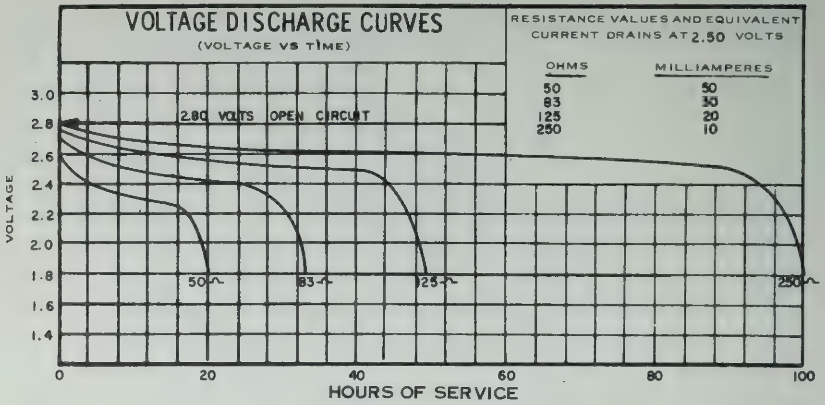
SPECIFICATIONS

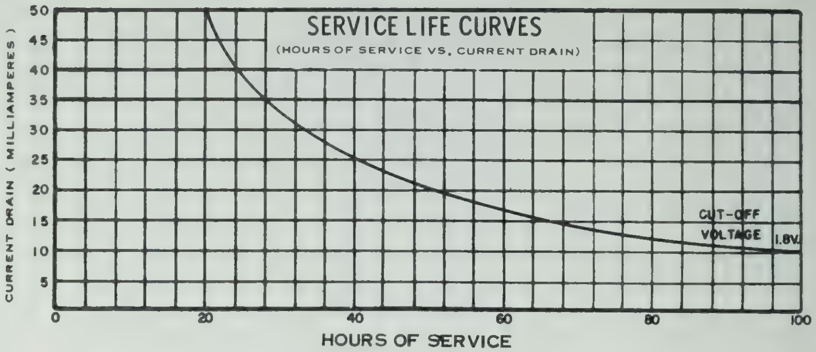
Voltage Taps	−, + 2.80
Service Capacity (to 1.8 volts) (Rated capacity at 35 milliamperes)	1000 milliampere-hours
Terminals	Button
Average Weight	0.90 oz.
Volume	0.43 cubic inches
Cells	Two No. 1 in series

For service information see reverse side of this sheet

"EVEREADY" NO. E132E

Estimated Service at 70°F



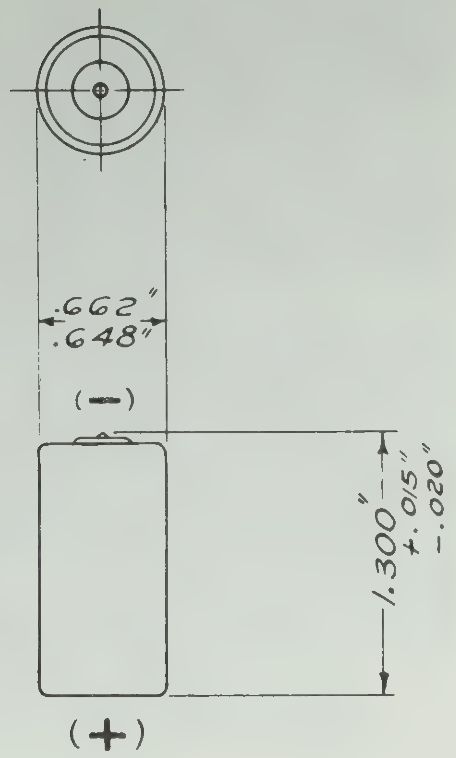


NOTES
CURRENT DRAIN VALUES DETERMINED AT 2.50 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E132N BATTERY

Type—Mercury

Suggested Current Range: 0-100 milliamperes



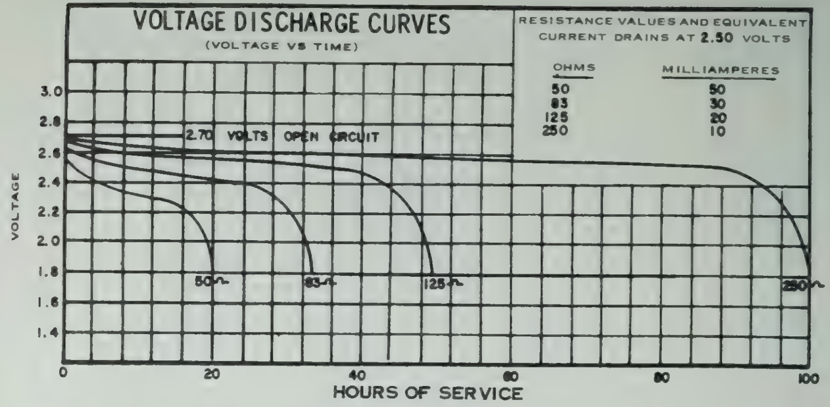
SPECIFICATIONS

Voltage Taps	—, + 2.70
Service Capacity (to 1.8 volts)	1000 milliampere-hours
(Rated capacity at 35 milliamperes)	
Terminals	Button
Average Weight	0.90 oz.
Volume	0.43 cubic inches
Cells	Two No. 1 in series

For service information see reverse side of this sheet

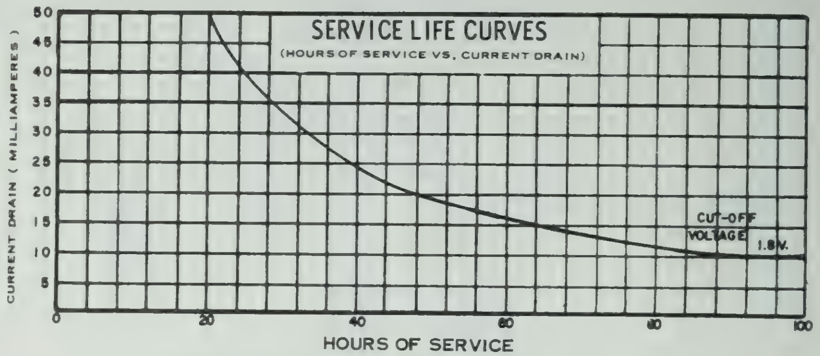
"EVEREADY" NO. E132N

Estimated Service at 70°F



RESISTANCE VALUES AND EQUIVALENT CURRENT DRAINS AT 2.50 VOLTS

OHMS	MILLIAMPERES
50	50
83	30
125	20
250	10



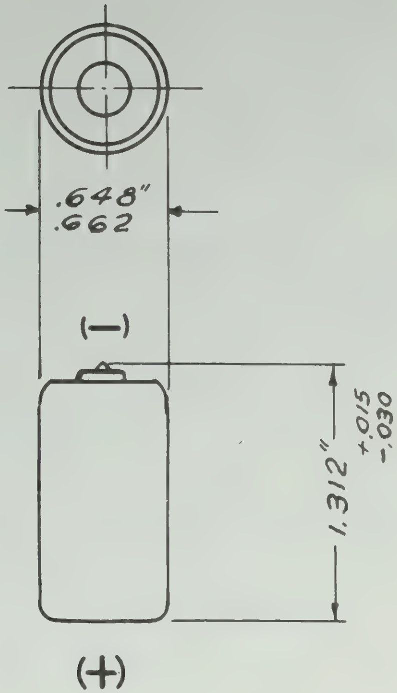
NOTES CURRENT DRAIN VALUES DETERMINED AT 2.50 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E163 BATTERY

Type — Mercury

NEDA Number — 1305

Suggested Current Range: 0-50 milliamperes



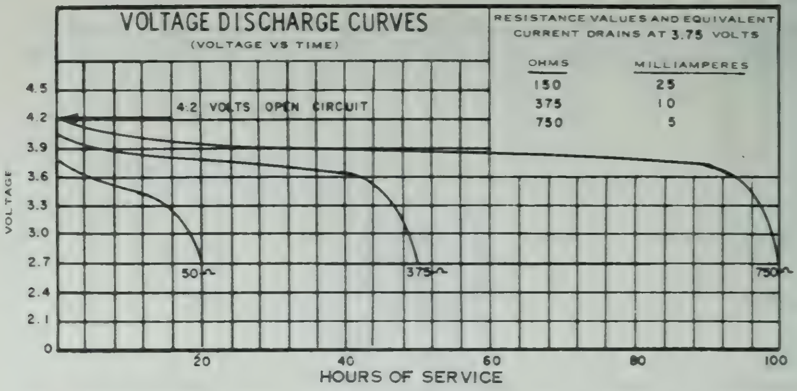
SPECIFICATIONS

Voltage Taps	–, + 4.20
Service Capacity (to 2.7 volts) (Rated capacity at 15 milliamperes)	500 milliampere-hours
Terminals	Button
Average Weight	0.87 oz.
Volume	0.44 cubic inches
Cells	Three No. 640 in series

For service information see reverse side of this sheet

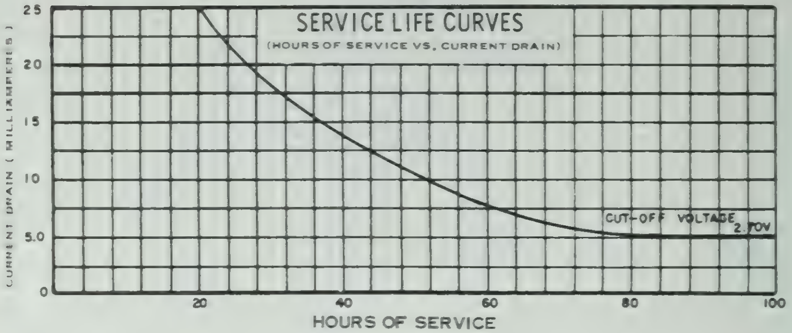
"EVEREADY" NO. E163

Estimated Service at 70°F



RESISTANCE VALUES AND EQUIVALENT CURRENT DRAINS AT 3.75 VOLTS

OHMS	MILLIAMPERES
150	25
375	10
750	5

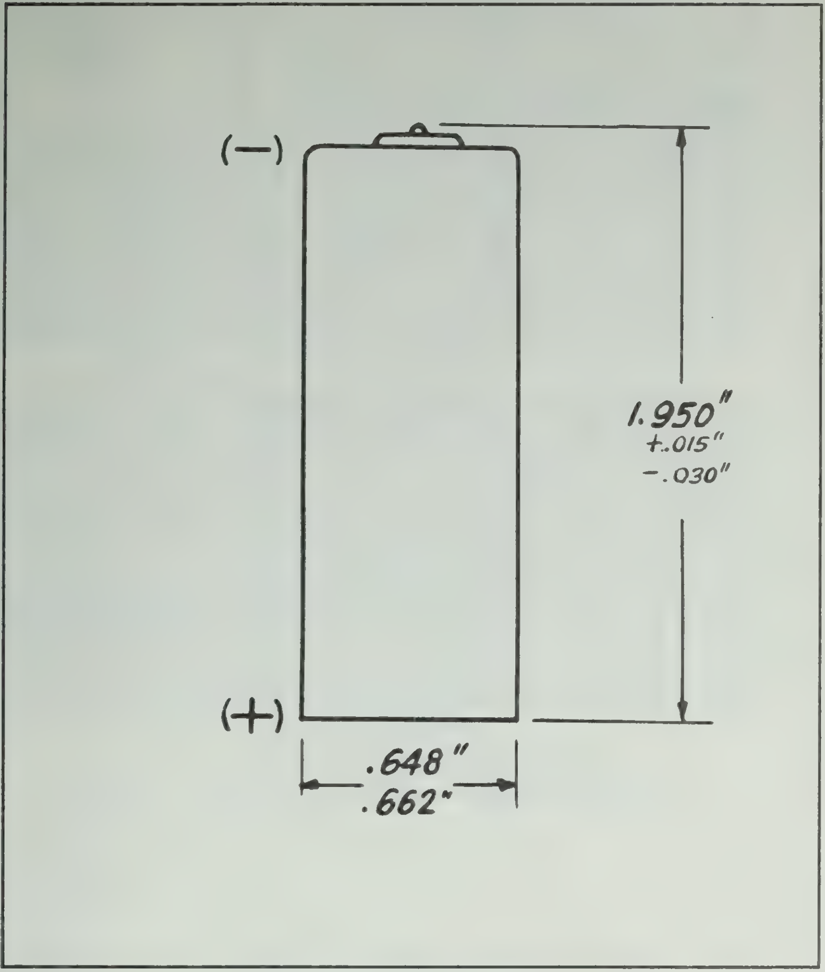


NOTES CURRENT DRAIN VALUES DETERMINED AT 3.75 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E133 BATTERY

Type—Mercury

Suggested Current Range: 0-100 milliamperes



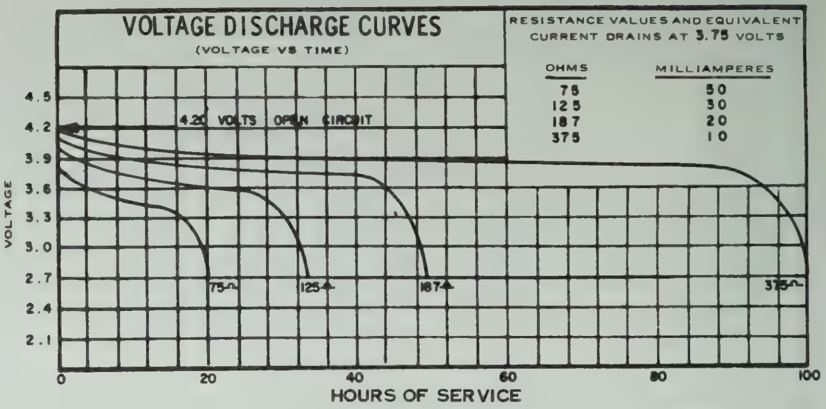
SPECIFICATIONS

Voltage Taps	−, + 4.20
Service Capacity (to 2.7 volts) (Rated capacity at 35 milliamperes)	1000 milliampere-hours
Terminals	Button
Average Weight	1.40 oz.
Volume	0.65 cubic inches
Cells	Three No. 1 in series

For service information see reverse side of this sheet

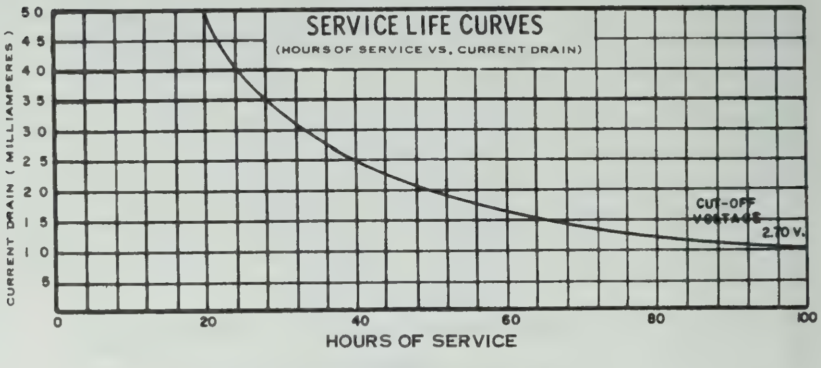
"EVEREADY" NO. E133

Estimated Service at 70°F



RESISTANCE VALUES AND EQUIVALENT CURRENT DRAINS AT 3.75 VOLTS

OHMS	MILLIAMPERES
75	50
125	30
187	20
375	10

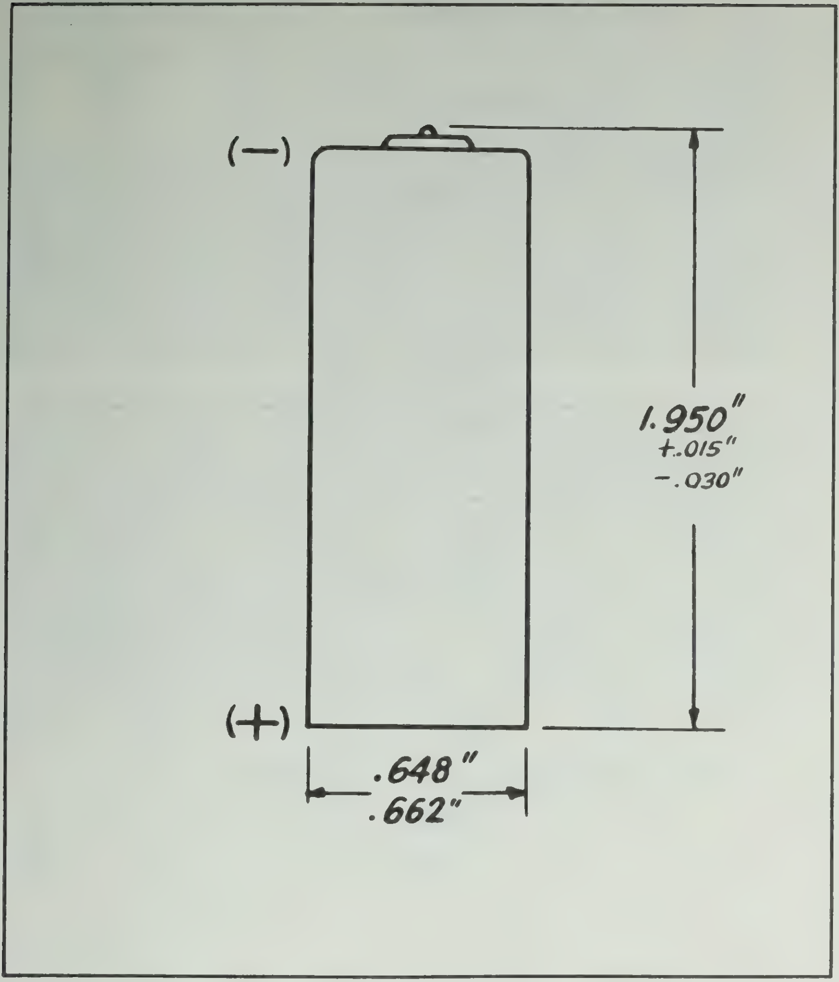


NOTES CURRENT DRAIN VALUES DETERMINED AT 3.75 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E133E BATTERY

Type—Mercury

Suggested Current Range: 0-100 milliamperes



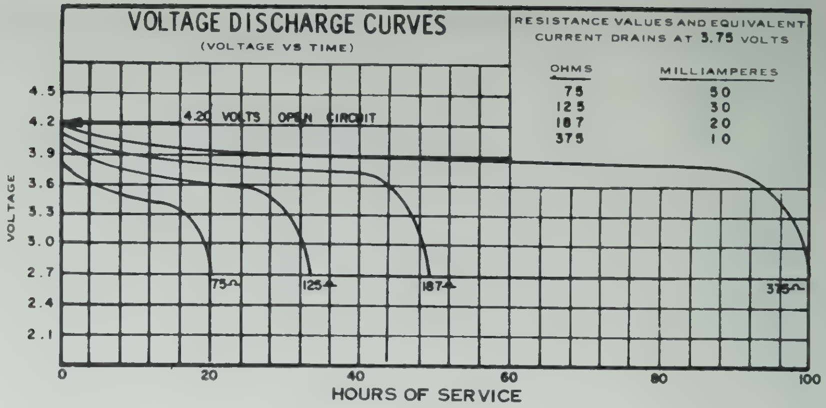
SPECIFICATIONS

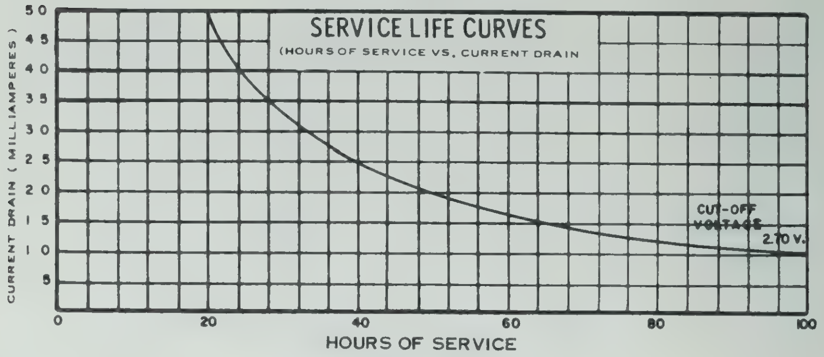
Voltage Taps	−, + 4.20
Service Capacity (to 2.7 volts) (Rated capacity at 35 milliamperes)	1000 milliampere-hours
Terminals	Button
Average Weight	1.40 oz.
Volume	0.65 cubic inches
Cells	Three No. 1 in series

For service information see reverse side of this sheet

"EVEREADY" NO. E133E

Estimated Service at 70°F





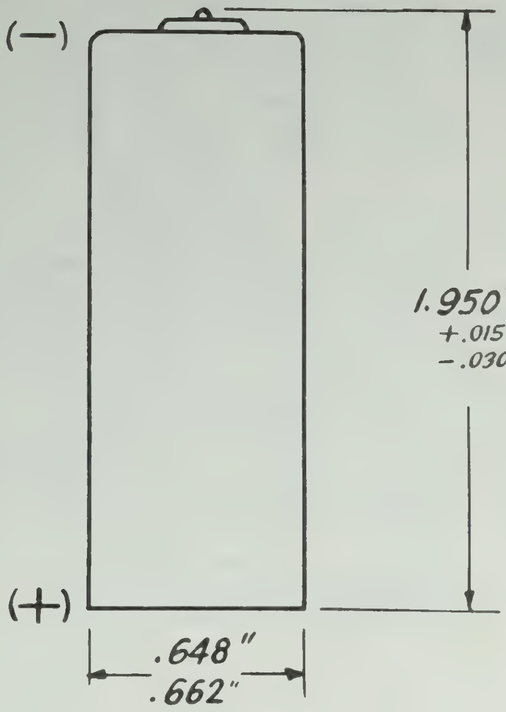
NOTES CURRENT DRAIN VALUES DETERMINED AT 3.75 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E133N BATTERY

Type — Mercury

NEDA Number — 1304

Suggested Current Range: 0-100 milliamperes



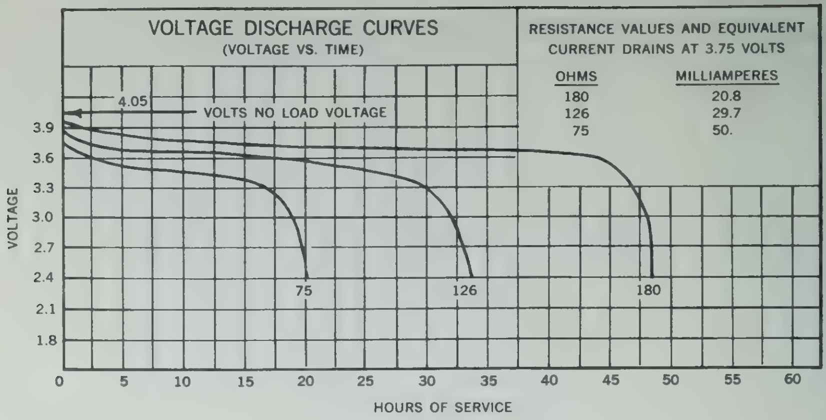
SPECIFICATIONS

Voltage Taps	−, + 4.05
Service Capacity (to 2.7 volts) (Rated capacity at 35 milliamperes)	1000 milliampere-hours
Terminals	Button
Average Weight	1.40 oz.
Volume	0.65 cubic inches
Cells	Three No. 1 in series

For service information see reverse side of this sheet

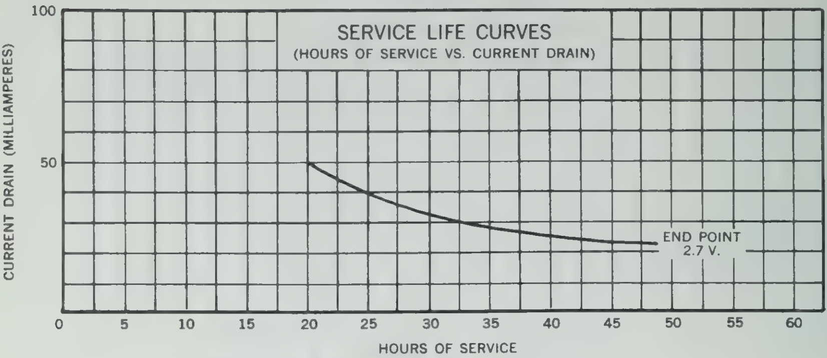
"EVEREADY" NO. E133N

Estimated Service at 70°F



RESISTANCE VALUES AND EQUIVALENT CURRENT DRAINS AT 3.75 VOLTS

OHMS	MILLIAMPERES
180	20.8
126	29.7
75	50.



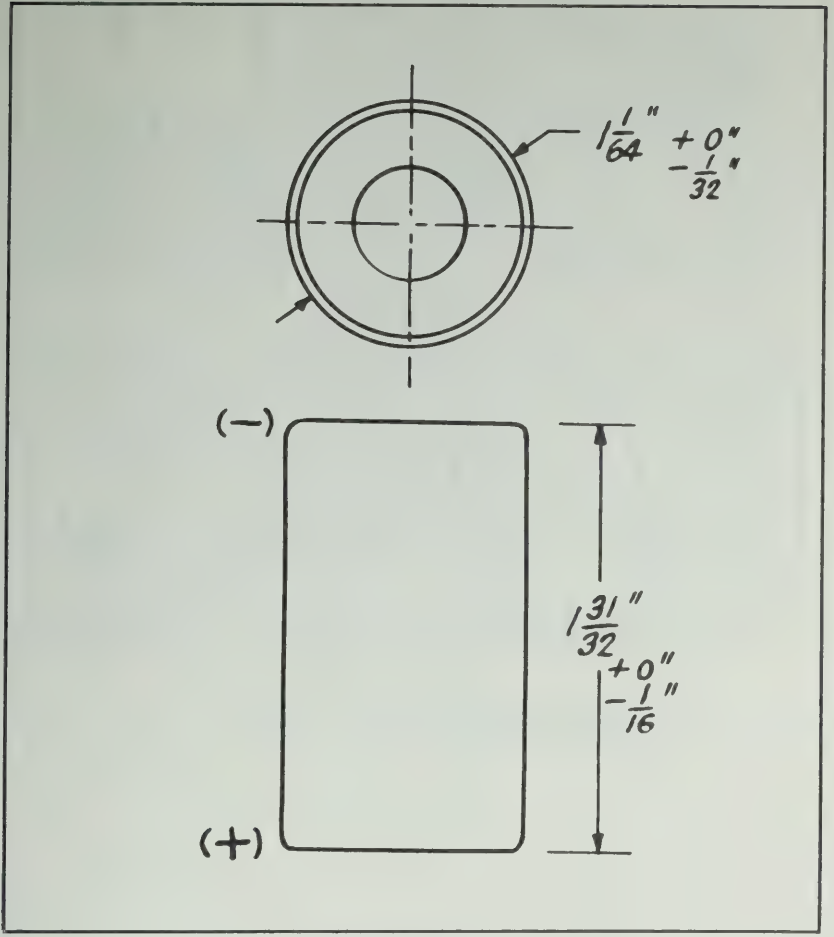
NOTES: CURRENT DRAIN VALUES DETERMINED AT 3.75 VOLTS
INDICATED PERFORMANCE AT 70° F.
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E233 BATTERY

Type—Mercury

NEDA Number—1300

Suggested Current Range: 0-60 milliamperes



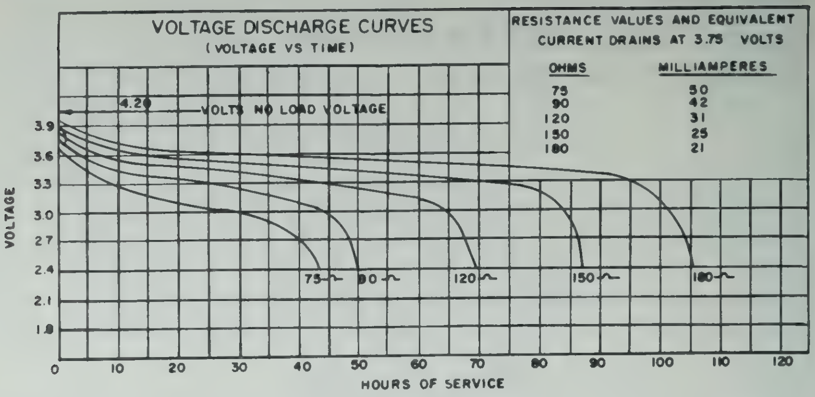
SPECIFICATIONS

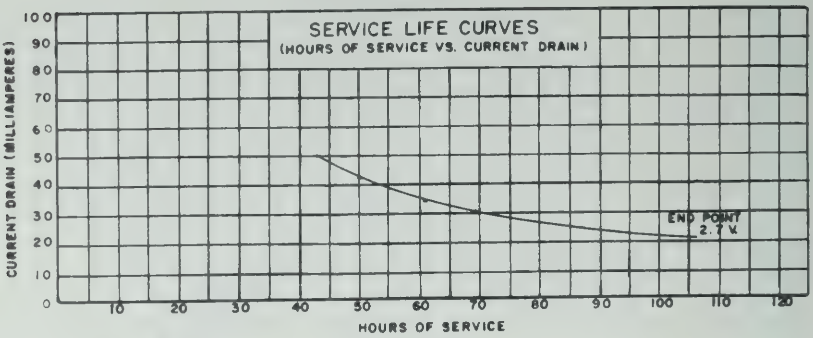
Voltage Taps	−, + 4.20
Service Capacity (to 2.7 volts) (Rated capacity at 42 milliamperes)	2200 milliampere-hours
Terminals	Button
Average Weight	3.0 oz.
Volume	1.60 cubic inches
Cells	Three No. 3 in series

For service information see reverse side of this sheet

"EVEREADY" NO. E233

Estimated Service at 70°F





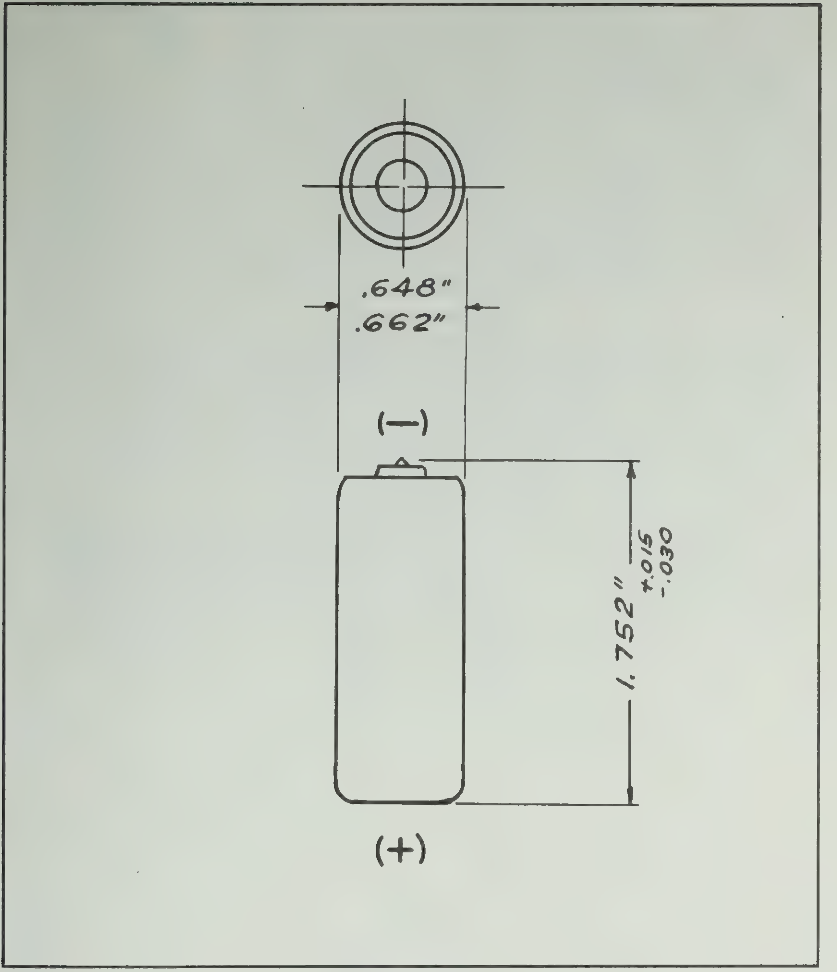
NOTES CURRENT DRAIN VALUES DETERMINED AT 3.75 VOLTS
INDICATED PERFORMANCE AT 70° F.
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E164 BATTERY

Type — Mercury

NEDA Number — 1404

Suggested Current Range: 0-50 milliamperes



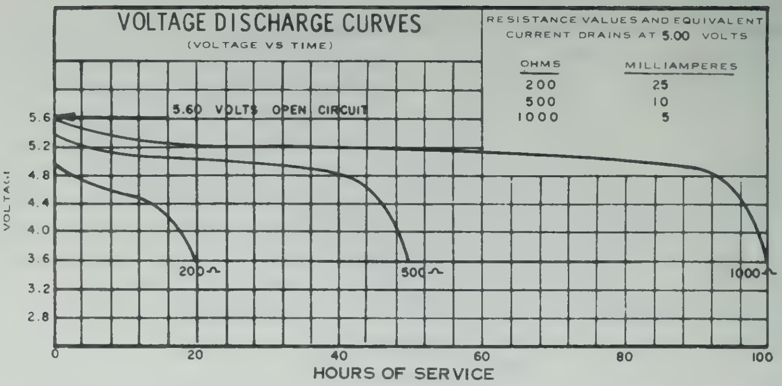
SPECIFICATIONS

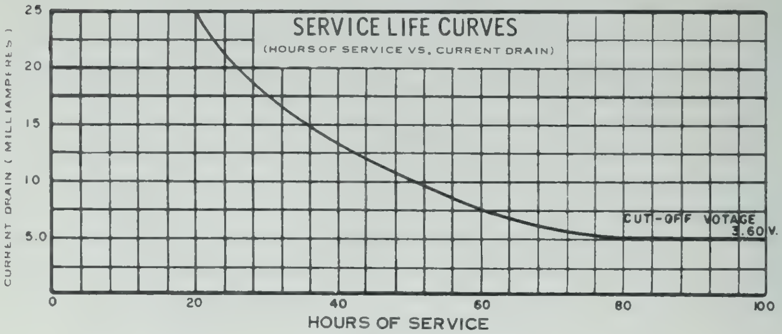
Voltage Taps	—, + 5.60
Service Capacity (to 3.6 volts) (Rated capacity at 15 milliamperes)	500 milliampere-hours
Terminals	Button
Average Weight	1.16 oz.
Volume	0.58 cubic inches
Cells	Four No. 640 in series

For service information see reverse side of this sheet

"EVEREADY" NO. E164

Estimated Service at 70°F





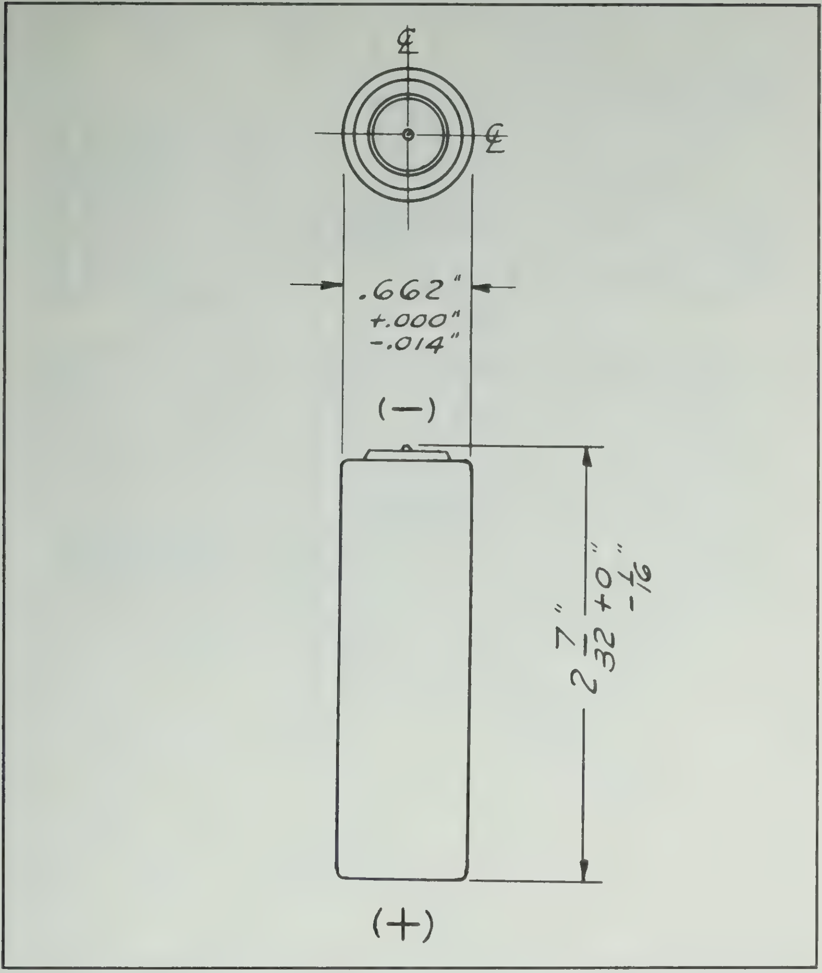
NOTES CURRENT DRAIN VALUES DETERMINED AT 5.00 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E165 BATTERY

Type — Mercury

NEDA Number — 1500

Suggested Current Range: 0-50 milliamperes



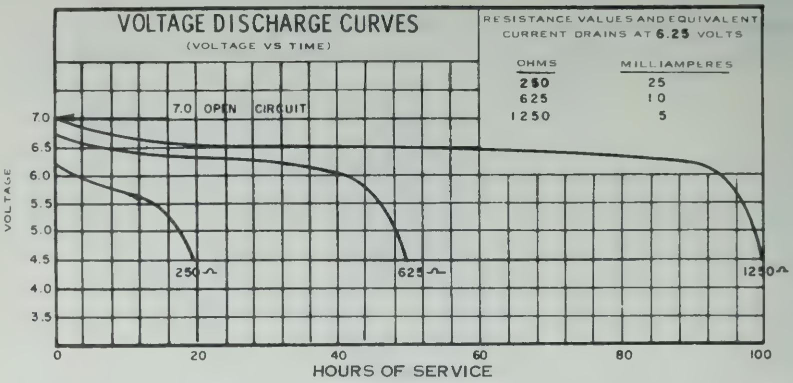
SPECIFICATIONS

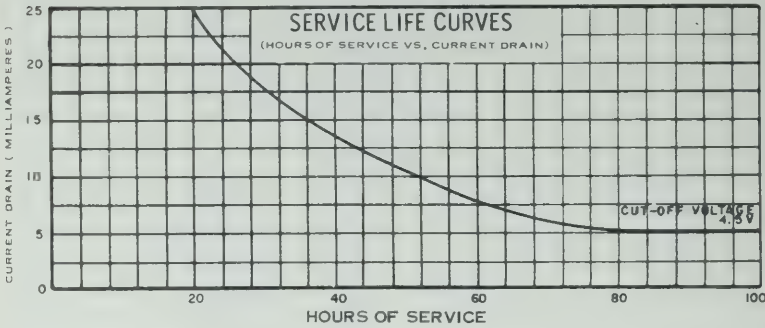
Voltage Taps	−, + 7.00
Service Capacity (to 4.5 volts) (Rated capacity at 15 milliamperes)	500 milliampere-hours
Terminals	Button
Average Weight	1.45 oz.
Volume	0.73 cubic inches
Cells	Five No. 640 in series

For service information see reverse side of this sheet

"EVEREADY" NO. E165

Estimated Service at 70°F



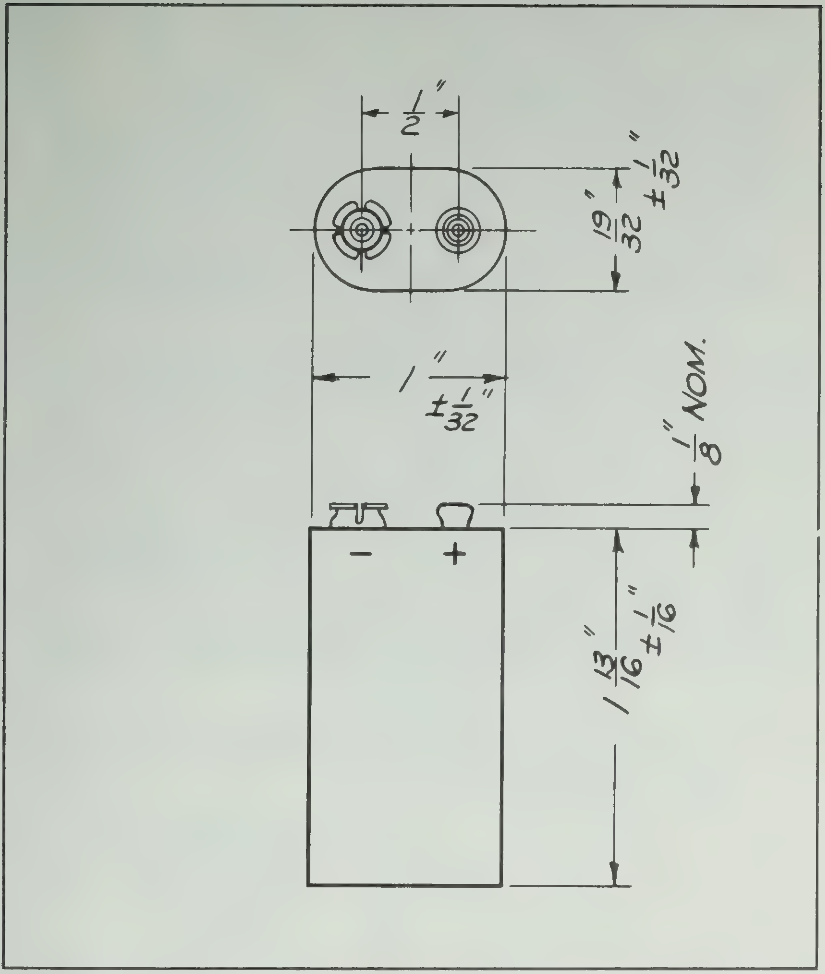


NOTES
CURRENT DRAIN VALUES DETERMINED AT 6.25 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E146 BATTERY

Type — Mercury

Suggested Current Range: 0-30 milliamperes



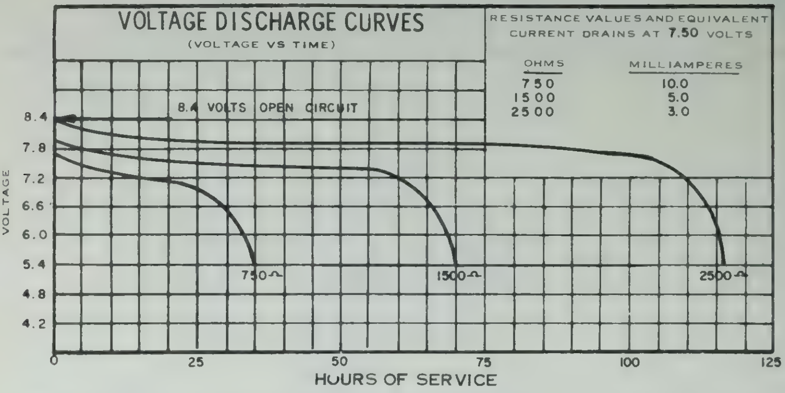
SPECIFICATIONS

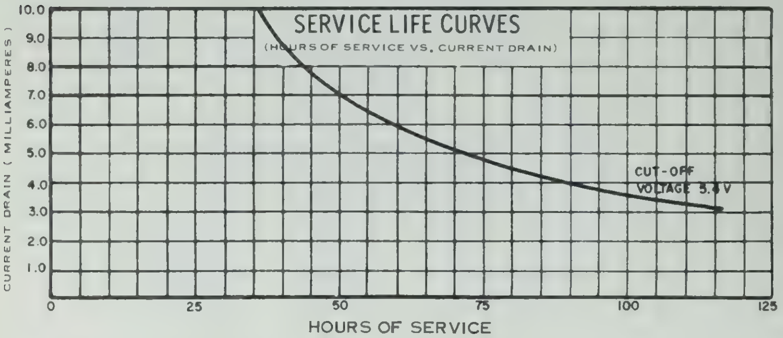
Voltage Taps	−, + 8.40
Service Capacity (to 5.4 volts)	350 milliampere-hours
(Rated capacity at 3 milliamperes)	
Terminals	Miniature Snap
Average Weight	1.6 oz.
Volume	0.9 cubic inches
Cells	Six No. 450 in series

For service information see reverse side of this sheet

"EVEREADY" NO. E146

Estimated Service at 70°F





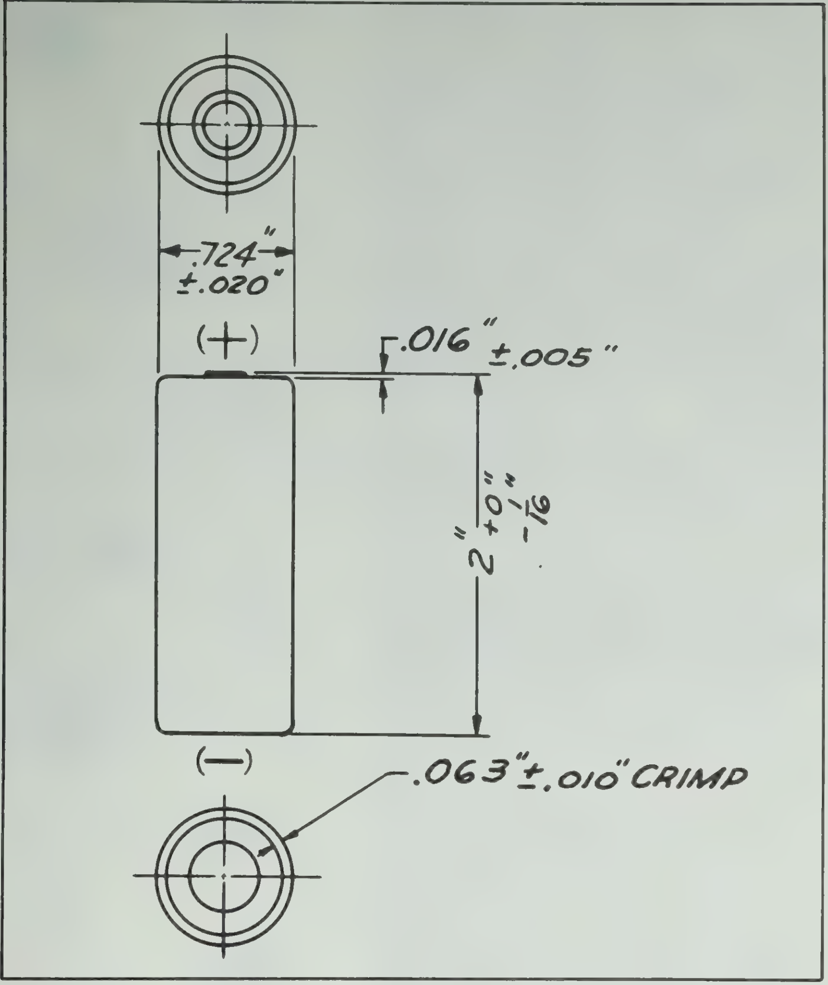
NOTES CURRENT DRAIN VALUES DETERMINED AT 7.50 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

"EVEREADY" NO. E126 BATTERY

Type—Mercury

NEDA Number—1611

Suggested Current Range: 0-40 milliamperes



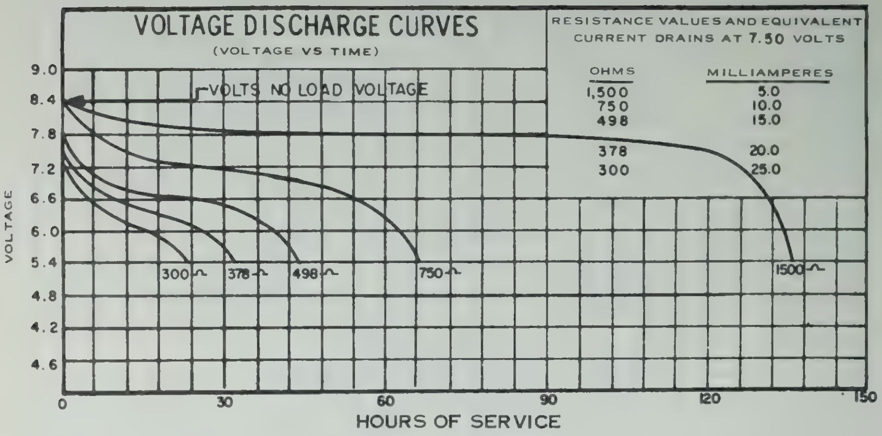
SPECIFICATIONS

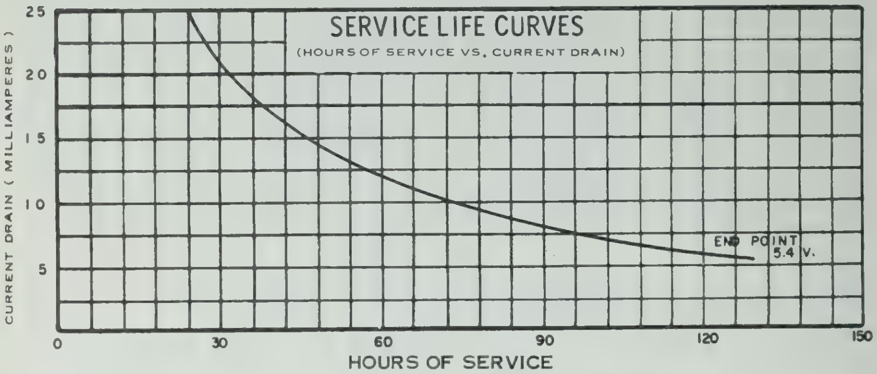
Voltage Taps	−, + 8.40
Service Capacity (to 0.9 volt) (Rated capacity at 15 milliamperes)	600 milliampere-hours
Terminals	Flat Contacts, Negative Recessed
Average Weight	1.65 oz.
Volume	0.82 cubic inches
Cells	Six No. 660 in series

For service information see reverse side of this sheet

"EVEREADY" NO. E126

Estimated Hours Service at 70°F





NOTES CURRENT DRAIN VALUES DETERMINED AT 7.50 VOLTS
INDICATED PERFORMANCE AT 70 F
ALL CURVES REPRESENT CONTINUOUS LOAD CONDITIONS

SILVER BATTERIES

Silver Batteries

The silver oxide-alkaline-zinc (Ag_2O-KOH-Zn) primary battery described below is a major contribution to miniature power sources. It is the result of a research and development program of many years.

"Eveready" silver oxide batteries provide a higher voltage and greater milliwatt-hour ratings than existing batteries of similar size. They offer a flat voltage characteristic. Silver oxide batteries have good low temperature characteristics compared to existing batteries. Their impedance is low and uniform.

The silver oxide battery consists of a depolarizing silver oxide cathode, a zinc anode of high surface area and a highly alkaline electrolyte. The electrolyte is potassium hydroxide in hearing aid batteries. This is used to obtain maximum power density at hearing aid current drains. Sodium hydroxide is used in watch batteries for long term reliability. Mixtures of silver oxide and manganese dioxide may be tailored to provide a flat discharge curve or increased service hours.

Silver oxide batteries are well suited, for example, for use in hearing aids, electric watches and as reference voltage sources.

A cutaway of a silver oxide cell is shown in Figure 1.

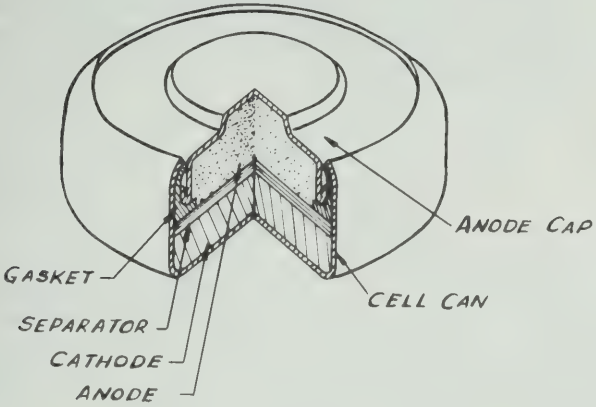


FIGURE 1

The manner in which the cell is designed results in high volumetric efficiency. An effective radial seal is a unique feature of the construction.

The open circuit voltage of the silver oxide cell is 1.6 volts. The operating voltage at typical current drains is 1.5 volts, compared to 1.3 volts for mercury cells. In hearing aid design the high voltage and flat characteristic of the silver oxide cell can be used to obtain more power or more service life than is available from miniature batteries of the same size.

The impedance of silver oxide batteries for hearing aid use is low and consistent. It does not rise appreciably until after the voltage of the battery has fallen below a useful operating level.

"Eveready" silver oxide batteries will stand severe abuse with no hazard for personnel or equipment. They have been thoroughly tested by short circuiting, high temperature and high temperature-high humidity storage for months, and by keeping cells on load for long periods after exhaustion. In every case, there was no appreciable change in cell dimensions.

The range of service capacity of the various cells currently available, and described in the following pages, is from 100 to 165 milliampere-hours.

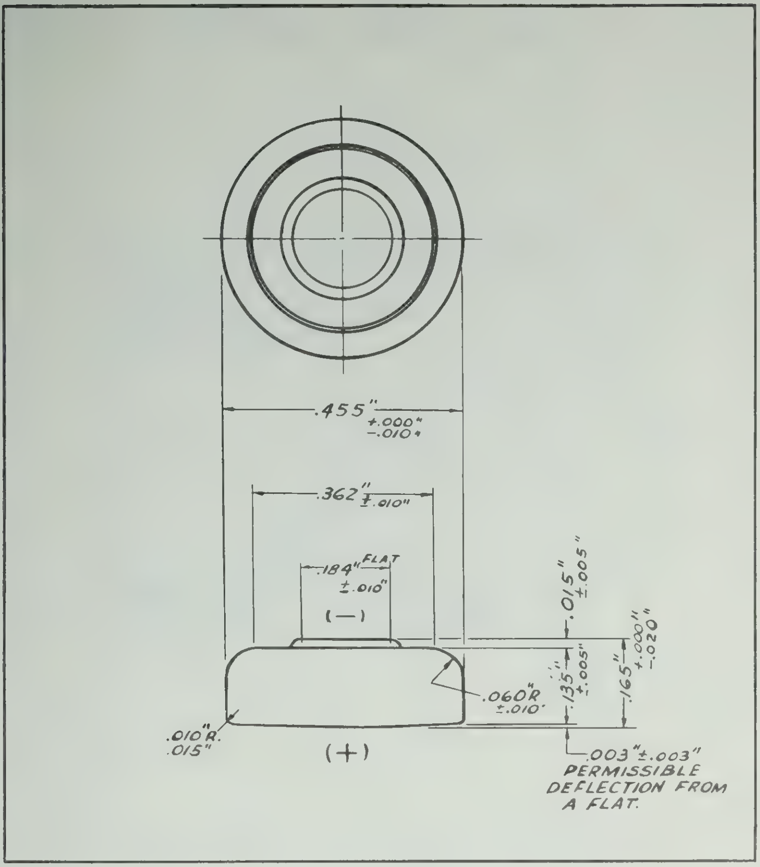
Silver oxide cells have an excellent shelf life. Service life maintenance is 90% after one year of storage at 70°F.

"Eveready" silver oxide cells exhibit good low temperature performance characteristics. Because of the relatively large surface area of the anode, they supply at low temperatures many times the service capacity of existing batteries of comparable size.

"EVEREADY" NO. 301 CELL

Type — Silver Oxide

Suggested Current Range: 0-100 Microamperes



SPECIFICATIONS

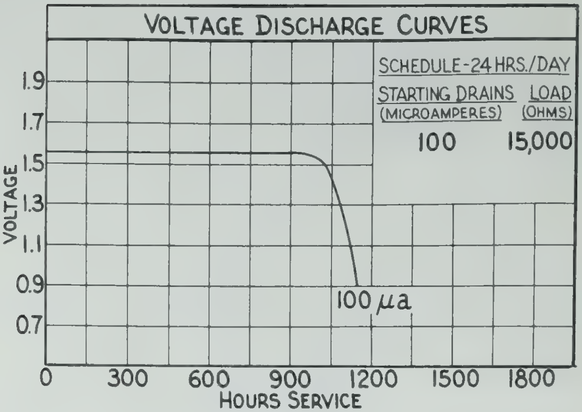
Voltage Taps	−, + 1.5
Service Capacity (to 0.9 volt) (Rated capacity at 100 microamperes)	100 milliampere-hours
Terminals	Flat Contacts
Average Weight	0.06 oz.
Volume	0.02 cubic inches
Cell	One No. 415

For service information see reverse side of this sheet

"EVEREADY" NO. 301

Estimated Service at 95°F

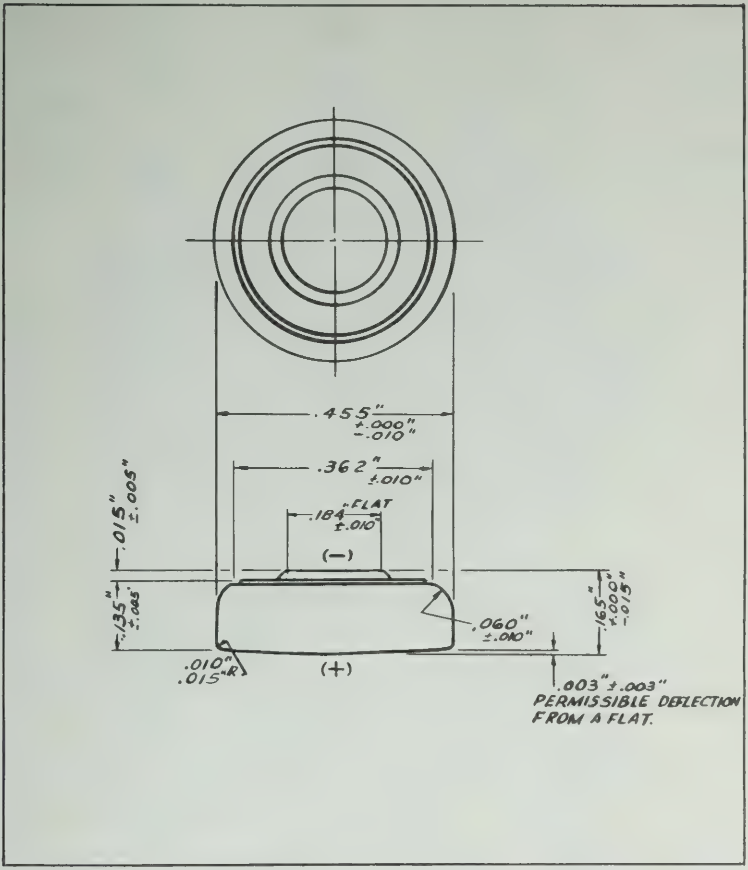
SCHEDULE	STARTING DRAINS (microamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 0.9V	CUT-OFF VOLTAGE 1.4V
24 hrs./day	7	214,300	20 months	19.7 months
	100	15,000	1090 hours	1000 hours



"EVEREADY" NO. S41 CELL

Type — Silver Oxide

Suggested Current Range: 0-10 Milliamperes



SPECIFICATIONS

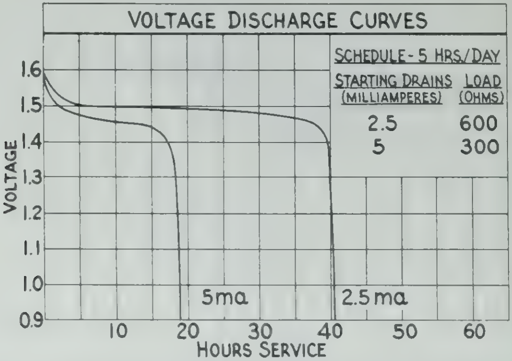
Voltage Taps	—, + 1.5
Service Capacity (to 0.9 volt) (Rated capacity at 2.5 milliamperes)	105 milliampere-hours
Terminals	Flat Contacts
Average Weight	0.06 oz.
Volume	0.02 cubic inches
Cell	One No. 415

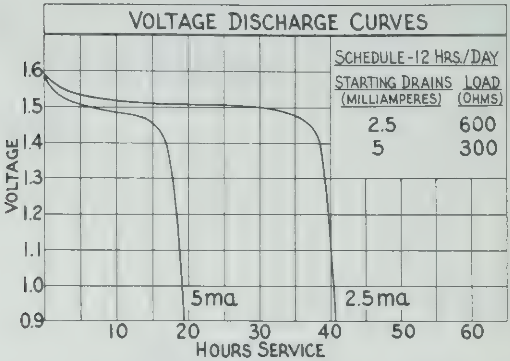
For service information see reverse side of this sheet

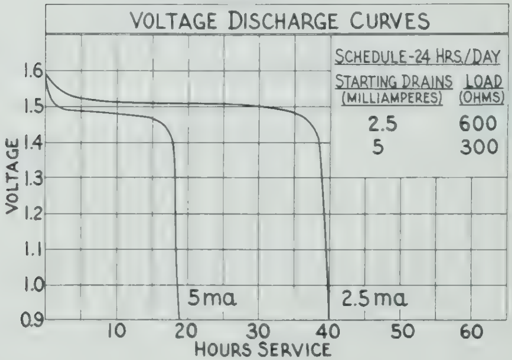
"EVEREADY" NO. S41

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE		
			0.9V	1.3V	1.4V
5 hrs./day	2.5	600	40.5		39.5
	5.0	300	19	18	
12 hrs./day	2.5	600	41		39
	5.0	300	19	17.5	
24 hrs./day	2.5	600	40		38
	5.0	300	18	17	



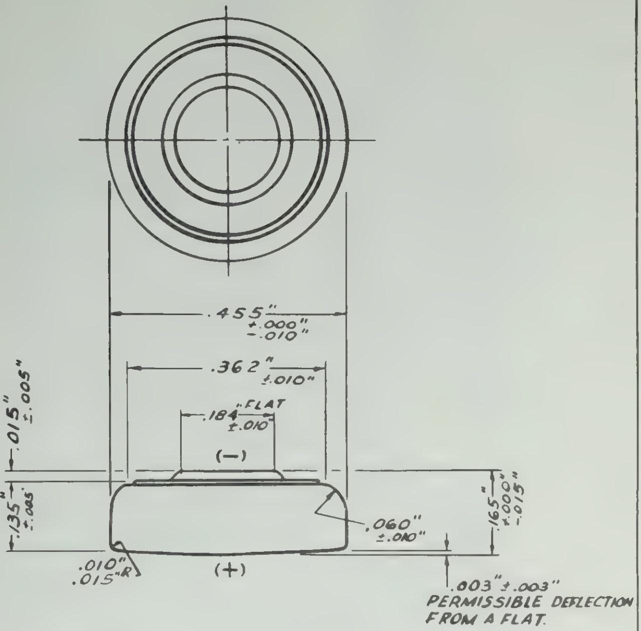




"EVEREADY" NO. S41E CELL

Type — Silver Oxide

Suggested Current Range: 0-10 Milliamperes



SPECIFICATIONS

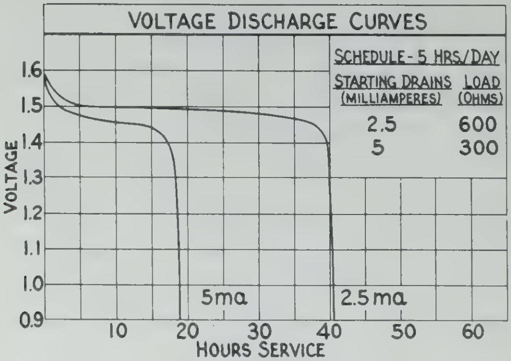
Voltage Taps	—, + 1.5
Service Capacity (to 0.9 volt) (Rated capacity at 2.5 milliamperes)	105 milliampere-hours
Terminals	Flat Contacts
Average Weight	0.06 oz.
Volume	0.02 cubic inches
Cell	One No. 415

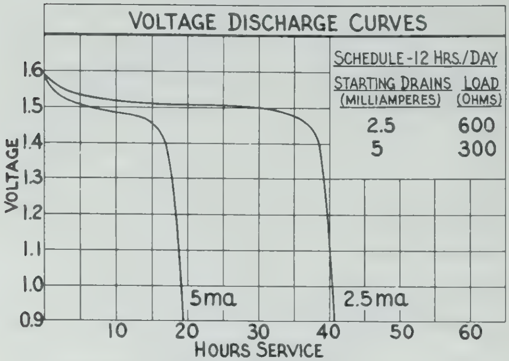
For service information see reverse side of this sheet

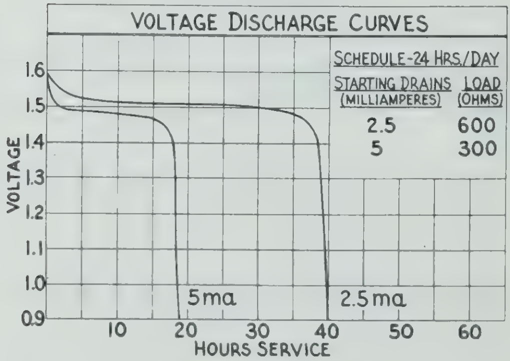
"EVEREADY" NO. S41E

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE		
			0.9V	1.3V	1.4V
5 hrs./day	2.5	600	40.5		39.5
	5.0	300	19	18	
12 hrs./day	2.5	600	41		39
	5.0	300	19	17.5	
24 hrs./day	2.5	600	40		38
	5.0	300	18	17	



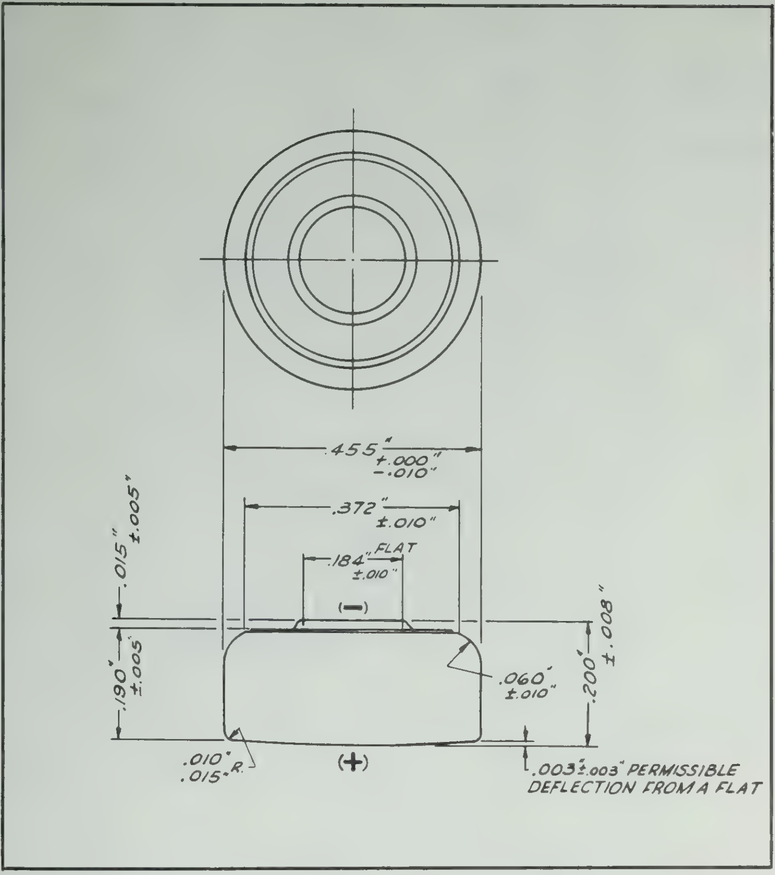




"EVEREADY" NO. S76 CELL

Type — Silver Oxide

Suggested Current Range: 0-10 Milliamperes



SPECIFICATIONS

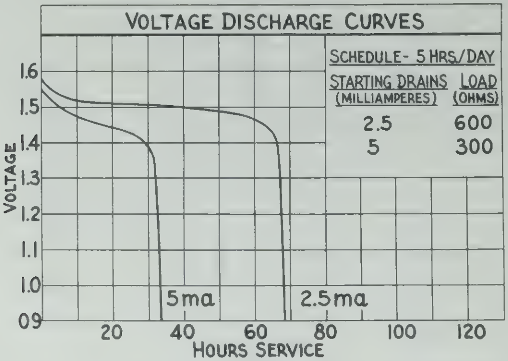
Voltage Taps	−, + 1.5
Service Capacity (to 0.9 volt) (Rated capacity at 2.5 milliamperes)	165 milliampere-hours
Terminals	Flat Contacts
Average Weight	0.08 oz.
Volume	0.03 cubic inches
Cell	One No. 421

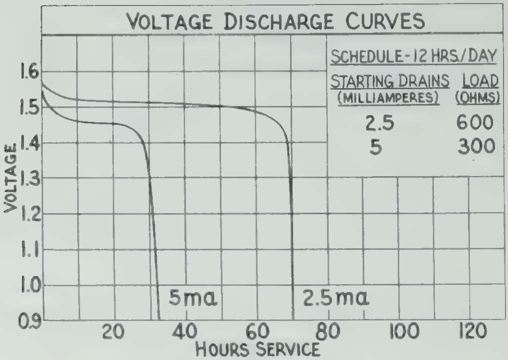
For service information see reverse side of this sheet

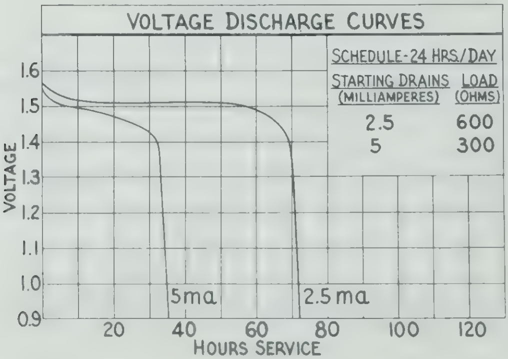
"EVEREADY" NO. S76

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE		
			0.9V	1.3V	1.4V
5 hrs./day	2.5	600	69		68
	5.0	300	33	32	
12 hrs./day	2.5	600	70		69
	5.0	300	32	30	
24 hrs./day	2.5	600	71		69
	5.0	300	36	32	



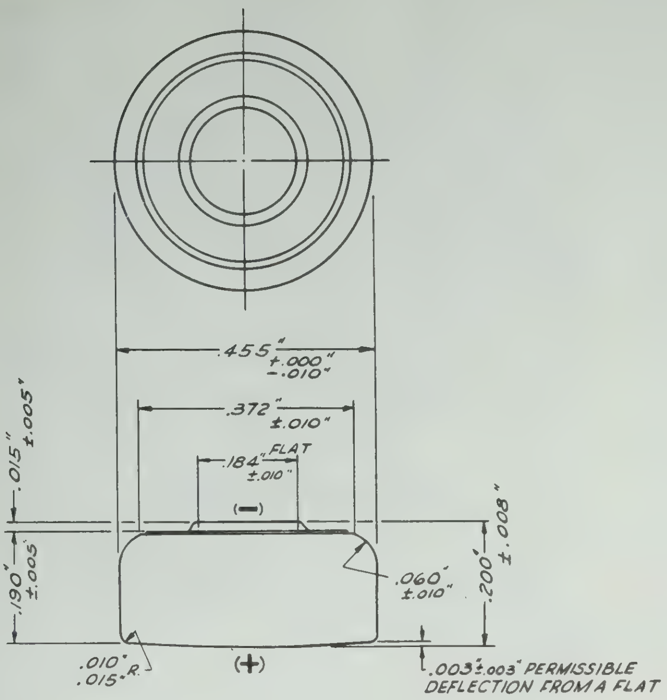




"EVEREADY" NO. S76E CELL

Type — Silver Oxide

Suggested Current Range: 0-10 Milliamperes



SPECIFICATIONS

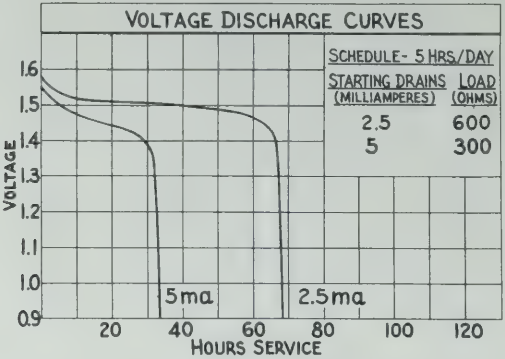
Voltage Taps	−, + 1.5
Service Capacity (to 0.9 volt) (Rated capacity at 2.5 milliamperes)	165 milliampere-hours
Terminals	Flat Contacts
Average Weight	0.08 oz.
Volume	0.03 cubic inches
Cell	One No. 421

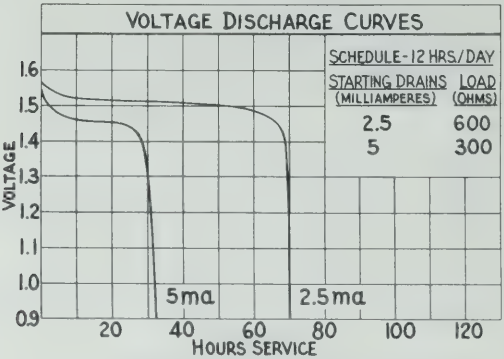
For service information see reverse side of this sheet

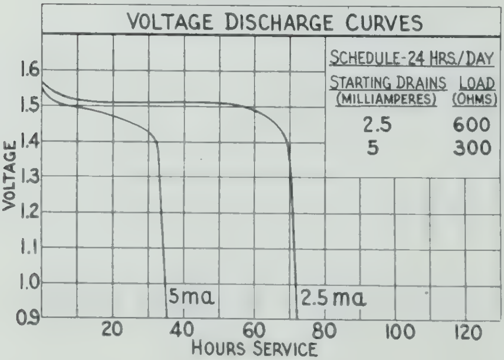
"EVEREADY" NO. S76E

Estimated Hours Service at 70°F

SCHEDULE	STARTING DRAINS (milliamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 0.9V	1.3V	1.4V
5 hrs./day	2.5	600	69		68
	5.0	300	33	32	
12 hrs./day	2.5	600	70		69
	5.0	300	32	30	
24 hrs./day	2.5	600	71		69
	5.0	300	36	32	



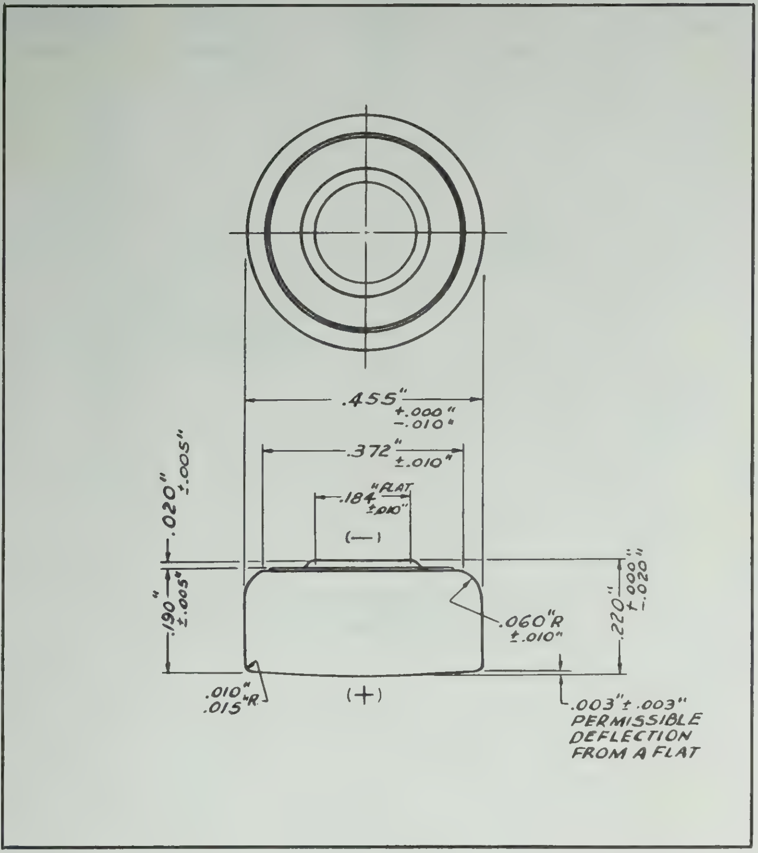




"EVEREADY" NO. 303 CELL

Type — Silver Oxide

Suggested Current Range: 0-240 Microamperes



SPECIFICATIONS

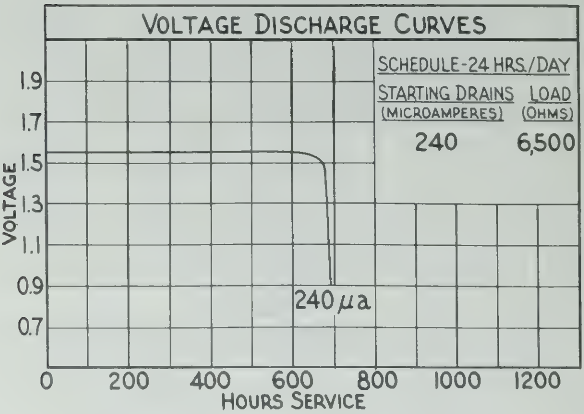
Voltage Taps	—, + 1.5
Service Capacity (to 0.9 volt) (Rated capacity at 240 microamperes)	165 milliampere-hours
Terminals	Flat Contacts
Average Weight	0.09 oz.
Volume	0.03 cubic inches
Cell	One No. 421

For service information see reverse side of this sheet

"EVEREADY" NO. 303

Estimated Service at 95°F

SCHEDULE	STARTING DRAINS (microamperes)	LOAD (ohms)	CUT-OFF VOLTAGE 0.9V	CUT-OFF VOLTAGE 1.4V
24 hrs./day	16	94,000	13 months	12.8 months
	240	6,500	697 hours	682 hours



BATTERY CROSS REFERENCE

"Eveready" Battery No.	Voltage	NEDA Number	"Burgess"	"RCA"	"Bright Star"	"Mallory"
E1	1.40	1100	Hg-1	VS143		RM-1
E1E	1.40					RM-1H
E1N	1.35		Hg-1R			RM-1R
E3	1.35		Hg-3R			RM-3R
E3E	1.40					RM-3H
E4	1.35		Hg-4R			RM-4R
E4E	1.40					RM-4H
EPX-4	5.40					PX-4
6 "Gray Label"	1.5	906	6 Tel.	VS006C	6 Tel.	M-906
6 "Ignitor"	1.5	905 914	6 Ign.	VS006S	6 Ign.	M-905 M-914
6 R.R. & Ind.	1.5	911	6 Ind.		6 Ind.	M-911
EPX-6	5.40, 12.15					PX-6
E9	1.40	1103	Hg-9	VS313		ZM-9
E9N	1.40					DM-9N
E12	1.40	1101	Hg-12	VS144		RM-12
E12E	1.40		9ES			RM-12H
E12N	1.35		Hg-12R			RM-12R
N22	1.25		CD1			
N24	1.25		CD2			
N26	1.25		CD8			
N26T	1.25		CD8L			
N28	1.25		CD3			
N28T	1.25		CD3L			
N32	1.25		CD4			
N32T	1.25		CD4L			
N33	1.25					
N33T	1.25					
N36	1.25		CD5			
N36T	1.25		CD5L			
N38	1.25					
N38T	1.25					
N39	1.25					
N40	1.25					
N40T	1.25					
N41	1.25					
N41T	1.25					
S41	1.5					
S41E	1.5					
E42	1.40					RM-42
E42N	1.35		Hg-42R			RM-42R
N43	1.25					
N43T	1.25					
N45	1.25		CD6L			
N46	1.25		CD6			
N52	1.25		CD9			
N54	1.25					
N56	1.25		CD7			
N57	1.25		CD10L			
N67	6		CD30			
N70	6		CD31			
N73	1.25		CD101			
N74	1.25		CD102			
N75	1.25		CD104			
N76	1.25		CD105			
S76	1.5					

OF COMPARATIVE AND INTERCHANGEABLE NUMBERS

"Eveready" Battery No.	"Philco"	"Ray-O-Vac"	"Sears"	"Ward"	"Wizard"	"Zenith"	*** Military
E1							
E1E		600F	6113			ZM1	
E1N							BA-1312/U
E3							BA-1330/U
E3E		3LA	6111				
E4							BA-1228/U
E4E		4LA	6112				
EPX-4							
6 "Gray Label"	*6 Tel.	6 Tel. C					
6 "Ignitor"	6	{ 6 Ign. S { 6 Ign.	4701	13250	7D7905		
6 R.R. & Ind.							BA-23
EPX-6							
E9							
E9N							
E12							
E12E							
E12N							BA-1328/U
N22							
N24							
N26							
N26T							
N28							
N28T							
N32							
N32T							
N33							
N33T							
N36							
N36T							
N38							
N38T							
N39							
N40							
N40T							
N41							
N41T							
S41							
S41E							
E42							
E42N							BA-1030/U
N43							
N43T							
N45							
N46							
N52							
N54							
N56							
N57							
N67							
N70							
N73							
N74							
N75							
N76							
S76							

"Eveready" Battery No.	Voltage	NEDA Number	"Burgess"	"RCA"	"Bright Star"	"Mallory"
S76E	1.5					
N77	1.25		CD107			
N79	1.25		CD108			
N81	1.25		CD109			
N83	1.25		CD110			
N85	1.25		CD111			
E90	1.5		AL-N	VS1073		Mn-9100
E91	1.5		AL-9	VS1334	7524	Mn-1500
E93	1.5		AL-1	VS1335	7522	Mn-1400
E94	1.5	927				
E95	1.5		A-2		7520	Mn-1300
E97S	1.5					
D99	1.5	813				
A100	1.5	13	230	VS336	0197	M-13R
E113	4.05		H113R			TR-113R
E114	5.40		H114R			TR-114R
E115	6.75		H115R			TR-115R
E120E	2.80					TR-120H
E122E	2.80					TR-122H
E126	8.4		H126	VS328		TR-126
E132	2.70	1200	H132R	VS148		TR-132R
E132B	2.80					TR-132BH
E132E	2.80					TR-132H
E133	4.20	1304	H133	VS149		TR-133
E133E	4.20					TR-133H
E133N	4.05					
E134	5.40		H134R			TR-134R
E135	6.75		H135R			TR-135R
E136	8.10		H136R			TR-136R
E137	9.45		H137R			TR-137R
E140E	1.40					TR-140H
E145	7.00		H145			TR-145
E146	8.40		H146	VS312		TR-146
E152	2.70		H152R			TR-152R
E152E	2.80					TR-152H
E153	4.05		H153R			TR-153R
E162	2.70		H162R			TR-162R
E163	4.20	1305	H163	VS163		TR-163
E164	5.60	1404	H164	VS164		TR-164
E165	7.00	1500	H165	VS165		TR-165
E169	12.6		H169			TR-169
E175	7.0	1501	H175			TR-175
E177	9.80	1606	H177 Y6	VS309A		TR-177
201	1.5					
206	9	1611	L6	VS327		TR-126
216	9	1604	2U6	VS323	0920	M-1604
226	9	1600	P6	VS300A	0918	M-1600
228	12	1810		VS329		
E233	4.20	1300	H233	VS400		TR-233
E234	5.60		H234			TR-234
239	9, 13.5	1900	XX9	VS304		*M-1900
243	4.5	1610	2Z3	VS324		
246	9	1602	2N6	VS305		M-1602
266	9	1605	M6	VS322		M-1605
274	6	1400	4D4			
276	9	1603	D6	VS306		M-1603
301	1.5					
303	1.5					
E312	1.4		Hg-312			RM-312
E312E	1.40					RM-312H

"Eveready" Battery No.	"Philco"	"Ray-O-Vac"	"Sears"	"Ward"	"Wizard"	"Zenith"	*** Military
S76E							
N77							
N79							
N81							
N83							
N85							
E90	P9100					ZM-9100	
E91	P1500						
E93				4LP			
E94							
E95							
E97S							
D99		5LP	4662				
A100	P920	13	6445	62-23	7D9013	Z4NL	
E113							
E114							
E115							
E120E							
E122E							
E126		1611M			7D9611		
E132		1200M					
E132B							
E132E						ZB1	
E133				7D9304			
E133E							
E133N							
E134							
E135							
E136							
E137							
E140E							
E145							
E146	P146	1604M	6416	62-124	7D9604	Z146	
E152							
E152E							
E153							
E162							
E163			6415	62-105			
E164				62-104			
E165							
E169							
E175							
E177		1606					
201							
206		1611M	6422				
216	P1604	1604	6417	62-123	7D7604	Z216	
226	P91	1600 1600M	6418 6421	62-96	7D7600	Z226	
228		1810M	6425				
E233	P696			*121			
E234							
.239		1900		62-95			
243							
246	P178	1602		62-92	7D7602		
266	P1605	1605					
274							
276	P88	1603	6419	62-93		Z276	
301							
303							
E312							
E312E							

"Eveready" Battery No.	Voltage	NEDA Number	"Burgess"	"RCA"	"Bright Star"	"Mallory"
333	4.5	1306		VS1149		Mn-1306
E340E	1.5					M-910H
W-350	22.5, 45	711	Z30NX	VS114		
W-351	22.5, 45		Z30BP			
W-352	3	701	F2BP	VS100	*260	
W-353	1.5	11	2F	VS141		
W-354	1.5	700	2FBP	VS101	*262	
W-356	3	**	2F2H	VS136		
W-357	3	901	4F2H	VS138	*126	
W-358	45		W30BPX			
W-359	45	**	A30	VS014	*30-55	
W-360	7.5	10	T5			
W-361	103.5	227	XX69			
W-362	4.5, 7.5		W5BP			
W-363F	22.5, 45	**	10308SC	VS127W		
W-363P	22.5, 45	**	10308Pi	*VS027	3060	
W-364F	22.5, 45	**	21308SC	VS157W	*30-61	
W-364P	22.5, 45	**	21308Pi			
W-365F	22.5, 45	723	2308SC	*VS126		
W-365P	22.5, 45	**	2308Pi	*VS026	*30-95	
W-366	1.5-63	407	4GA42	*VS053		
W-367	7.5-63	408	G5A42	*VS038		
W-368	6-75	**	F4A50			
W-369	1.5-90	410	6TA60	*VS054		
W-370	1.5-60	**	2TXX40			
W-371	3		2Z2Pi			
E400	1.35	1106	Hg-400R	VS145		RM-400R
E400E	1.40					RM-400H
E401	1.40	1102	Hg-401	VS401		RM-401
E401E	1.40					RM-401H
404E	15					
405E	22.5					
409	6	916	F4H Ind.	VS040C		M-916
411	15	208	U10	VS083		M-208
411E	15		U10E			M-208
412	22.5	215	U15 U15PF	VS084	12P	M-215
412E	22.5		U15E			M-215
413	30	210	U20	VS085		M-210
413E	30		U20E			M-210
415	45	213	U30	VS086		M-213
416	67.5	217	UX45	VS318		*M-217
417	15	224	K10			
420	22.5	225	K15			
425P	22.5		XX15 XX15E			
430	30	**	K20			
430P	30					
433P	33		XX22 XX22E			
437	75	212	XX50	VS217		M-212
E450	1.35		Hg-450R			RM-450R
E450E	1.40					RM-450H
455	45	**	XX30	VS055		*M-201
455P	45		XX30Pi XX30E			
457	67.5	**	K45	VS082		
460	45		K30P		47P	PX-17
467	67.5	200	XX45	VS016	45N	M-200

"Eveready" Battery No.	"Philco"	"Ray-O-Vac"	"Sears"	"Ward"	"Wizard"	"Zenith"	*** Military
333	P1306						
E340E						ZN	
W-350		711					BA-53
W-351		57R30SS					
W-352		701					BA-205
W-353		11		*28			
W-354		700					BA-15A
W-356		703					
W-357		901					BA-225/U
W-358							
W-359	*P210	206	*6460	*41	3B6228	Z530	
W-360		A10		*26			
W-361		69N					BA-38
W-362		7N5S					
W-363F		A716					
W-363P	*P30F	726	*6361	*73	*3B6220		
W-364F		715					BA-26
W-364P	*P30FL	727	*6360	*77			
W-365F		723					
W-365P	*P30D	717	*6363	*70			
W-366	*P41A4FL	407		*34	*3B6440		
W-367	*P87	408		*36			
W-368		411				*Z6394	
W-369		410					BA-48
W-370	*P89			*32			
W-371		37R4P					BA-227/U
E400							
E400E						ZM400	
E401		R401					
E401E						ZM401	
404E		618					
405E							
409		941RR	4702			Z916	
411		208				Z11M	BA-331/U
411E		510	6199			Z11	BA-331/U
412	*P612	215	8212	*86		Z12M	BA-261/U
412E		516	6194			Z12 Z225	BA-261/U
413		A210	8213	*87		Z13M	BA-305/U
413E		520	6195			Z13	BA-305/U
415	P150	213	6485	62-120		Z415	
416	P217	217					
417							
420							
425P		PN15					BA-232/U
430							
430P							
433P		PN22					BA-233/U
437	P144	212		*47		Z437	
E450							
E450E							
455	*P105	201		*79	7D7201	Z455	BA-56
455P		930P PN30F	6198 8255			Z30	BA-234/U
457		203				Z457	
460							
467	P67	200	6480	62-43	7D7200	Z67	BA-51

"Eveready" Battery No.	Voltage	NEDA Number	"Burgess"	"RCA"	"Bright Star"	"Mallory"
468	67.5	200	XX45R			
477	67.5	211P 211M	P45 P45M	VS215 VS218	675	M-211P
479	90	214	P60	VS219		M-214
482	45	202	M30	VS013	3033	*M-202
484	45	207	B30	VS012	3003	
487	22.5, 45		D30		3095	
489	225		XX150		39P	PF-489
490	90	204	N60	VS090	60N	
491	240		U160		24P	PF-491
492	180, 225		N150			PF-492
493	300	722	U200	VS093		
495	90	**	N60X	VS316		*M-216
497	180, 510		U320		51P	PF-497
E502	1.35		Hg-502R			RM-502R
E502E	1.40					RM-502H
504	15	220	Y10	VS704	15P	M-504
504E	15		Y10E			
505	22.5	221	Y15	VS705	22P	M-505
505E	22.5		Y15E			M-505
506	30	223	Y20			M-506
506E	30		Y20E			M-506
507	30	222	Y20S			M-507
507E	30					M-507
509	6	908	F4H	VS040C	460	M-908
510F	6	917	F4SC			
510S	1.5	**	F4BP	VS040S	*460S	M-915
515	6	**				
520	1.40	930				
E520E	6					RM-520H
523	4.5		AL-133	VS1149		Mn-1306
560	7.5					
561	15					
E601	1.35		Hg-601R			RM-601R
621	3					
E625	1.35		Hg-625R			RM-625R
E625E	1.40					RM-625H
E630	1.40	1104	Hg-630	VS147		RM-630
E630E	1.40					RM-630H
635	1.5	14	130	VS335	0198	M-14R
E640	1.40	1105	Hg-640	VS150		RM-640
E640E	1.40					RM-640H
E675	1.40		Hg-675			RM-675
E675E	1.40					RM-675H
702	4.5		B3RT			
703	4.5	**	532	VS133	0317-48	
704	3		F2RT			
706	6	902	4F4H	VS103		M-902
707	7.5	26	D5	VS315		M-26
708	22.5					
713	7.5	8	B5	VS129		
714	4.5					
715	7.5	903	4F5H	VS139	155	M-903
716	9	**	4F6H	VS140		M-904
717	7.5	9	C5	VS065	591	M-9
718	6	1	2F4	VS010	*866	
720	1.5	18	2D	VS069		
724	6	2	Z4	VS068		

"Eveready" Battery No.	"Philco"	"Ray-O-Vac"	"Sears"	"Ward"	"Wizard"	"Zenith"	*** Military
468							
477	*P175 P149	211P 211M	6482	62-40	7D7211	Z477	
479	P176	214	6470	62-55		Z90	
482	P45	202	6461	*42	3B6241	Z783	BA-59
484	*P305	207	*6462	*49	*3B6239	Z530	BA-223/U
487							
489		N150					
490	*P132	204	*6465	*46	3B6260	Z490	
491		1010					
492		1011					
493		722					BA-291/U
495	*P190					Z495	
497		1012					
E502							BA-1058/U
E502E		41					
504		220	8204			Z5M	BA-332/U
504E		10D	6115			Z5	BA-332/U
505		221	8205			Z6M	BA-304/U BA-333/U
505E		15D	6116			Z6	BA-304/U BA-333/U
506			8206				BA-334/U
506E		20DU	6117			Z7	BA-334/U
507							BA-335/U
507E							BA-335/U
509	P4F	941	4702	13257	7D8908	*Z107G	BA-200/U
510F		941C					
510S		941SC	4702ST		7D8915		
515		7R					
520							
E520E						ZM520	
523	P1306						
560	P560						
561							
E601							
621							
E625							BA-1006/U
E625E						ZM625	
E630	P630						
E630E							
635	P903	14	6446		7D7314	Z7	
E640	P640						
E640E							
E675							
E675E						ZM675	
702		533					
703		706					BA-9
704		921B					BA-204/U
706		902					BA-222/U
707	*P26	26				Z707	
708							
713		8					
714							
715		903					
716		904					BA-207/U
717	P31	9	6444	62-29	7D7009	Z750	
718		A1					BA-203/U
720		18					
724		A2					

"Eveready" Battery No.	Voltage	NEDA Number	"Burgess"	"RCA"	"Bright Star"	"Mallory"	
726	4.5	19	D3	VS072	305		
727	9-90	428	T6Z60P	VS059			
729	1.5-90	**	4TZ60	VS064			
731	6	918	TW1	VS317	158	M-918	
735	1.5	900	4FH	VS106	464	M-900	
736	4.5	3	F3	VS067	360	*M-3	
738	22.5, 45	205	Z30	VS015	3059		
740	1.5	719	20F	*VS024	*20-60		
741	1.5	17	8F		*860		
742	1.5	4	4F	VS004	462		
743	1.5	5	6F	*VS007	*660		
744	6	**	F4Pi	VS009	646	M-6	
746	4.5	7	G3	*VS002	361		
750	3	**	422	VS134	*50-17		
751	4.5	705	432	VS142	*51-17		
752	9-90	400	G6B60	VS047	*66-03	*M-400	
752W	9-90-1.5	**					
753	7.5, 9-90	401	F6A60	VS019	6650	*M-401	
754	7.5, 9-90	402	G6M60	*VS018			
755	6, 7.5-75	403	T5Z50	VS050	6652		
756	7.5, 9-90	**	T6Z60	VS057W	6653	M-405	
757	9-90	406	F6A60P	VS058	6654		
759	1.5-90	**	17GD60	VS022	6105	M-413	
761T	1.5, 3, 4.5	712	2370ST	VS130	*71-17S		
762S	22.5, 45	709	5308	VS112	*30-03BP		
763	22.5	710	4156	VS102	*15-50W		
766T	16.5 to 22.5	**	2156	*VS137	*15-90W		
771	3, 4.5	**	2370Pi	*VS030	71-17		
773	1.5 to 7.5	**	5540	VS029	51-03		
776	7.5, 9-90	**	S6D60	VS119			
778	3 to 22.5	**	5156SC	VS131	*15-03W		
781	4.5	**	5360	VS028	0317S		
785	7.5-75	431	T5Z50P	VS060			
789	3						
799	22.5, 45, 49.5		10338				
815	1.5		920	VS734	59P	M-15P	
835	1.5		120	VS735	11P	M-14P	
850	1.5		220	VS736	10P	M-13P	
904	1.5	910	NE N	VS073	20	M-910F	
912	1.5	24	7	VS074	58	M-24F	
915	1.5	**	Z	VS034A	59	M-15F	
935	1.5	814	1	VS035A	11M	M-14F	
950	1.5	813	2	VS036	10M	M-13F	
960P	1.5	23	8R	VS070			
964	1.5	20	21R	VS236	61R-156	M-20	
1015	1.5	15	930	VS334	0199	M-15R	
1015E	1.5		9R 9ES & 1ZE			M-15H	
1016	1.5		2Z				
1016E	1.5		2ZE				
1050	1.5		210		10MC	M-13X	
1052P	1.5		8R			EP-728	
1461	6	907	S461	VS039	146	M-907	
1462	6						
1463	12	922	2G8H				
1562	7.5	**			*156		

"Eveready" Battery No.	"Philco"	"Ray-O-Vac"	"Sears"	"Ward"	"Wizard"	"Zenith"	*** Military
726		19				Z450	
727		428				Z962	
729	P364	425					
731		918	4707	13274	7D8918		
735		900	2259		*3B6770		BA-35
736	P38	A3	*6441	62-26	7D7003	Z736	
738	*P104	205					BA-63
740	*P816	719	*6330	*66	*3B6122		
741		17		*20			
742	*P94	A4	*6430	*21	*3B6110	Z94	BA-65
743	*P96	A5	*6431	*25	*3B6115	Z96	
744	P4F4R	A6	*6451	*28	*3B6145		BA-210/U
746	*P100	A7	6440	*24	*3B6135	Z83A	BA-226/U
750		704					BA-208/U
751		705					BA-28
752	*P60B6F6	A400	6401	*37		Z985	
752W						Z985X	
753	*P841A	401	6407	62-33	*7D7401	Z979	
754		402	*6404	*35	*3B6470		
755	*P350	403	*6408		3B6464		
756	P371	405	6409	*82	7D7405		
757		406	*6410	*72	3B6462	Z909	
759	P60D11L	413	*6312 *6308	62-51 62-57	7D7413	Z802	BA-212/U
761T		712	*5005				BA-27
762S		709					BA-36
763		A710					BA-2
766T		702					BA-8
771	*P3D	718	*6390	*83	*3B6310		
773	*P5B	713	6363	*5226			BA-34
776	P326	415		62-54		Z990	
778		708		*84			BA-230/U
781		714					BA-31
785		431				Z775	
789		324 Spec.					
799		8333					
815		710LP					
835		110LP					
850		210LP	210LP				BA-202/UF
904		716		48-2338		N	
912	*K	400	4656		7D7024	Z912	
915	P15F	7LP or 7R	4653	48-2342	7D7015 7D8015	Z8	BA-58
935	P900	1LP	4659	48-2341	7D7014 7D8014	Z7	BA-42
950	P907	2LP	4650	48-2340	7D7013 7D8013	Z2NL	BA-30
960P		23				Z1	BA-231/U
964	P77	20	6442	62-27	7D8020	Z5	
1015	P15R or P1500	15	6447	62-67	7D7015	Z8	
1015E		41 (Sq.)	6192 8115			ZE, ZS & ZM10	
1016			8116				BA-272/U
1016E		42 (Sq.)	6193			2-ZS	BA-272/U
1050		3LP					
1052P		PX	8160			Z1-S	
1461	P64	641	4700	13255	7D8907		BA-44 & BA-249/U
1462							
1463		922					
1562							

"Eveready" Battery No.	Voltage	NEDA Number	"Burgess"	"RCA"	"Bright Star"	"Mallory"
1662	9	913			*166	
2314	12, 21	2400				
2356	9	1612	C6X			M-1612
2506	3, 6, 9	1601	D6Pi	VS301		
2709	9	1613		VS326		
2713	6	1403		VS325		
2731	4.5	1303		VS321		
2744	6	920	F4BW			M-920 or M-9200
2745	6	924				M-9240
2746	6	925				M-9250
2761	9	1608	D6S			M-1608
2762	9	1609				
2780	12	923				
E302125	7.0		302125-M			302125-M
E302157	1.35		302157			302157
E302158	2.70, 5.40, 22.95, 47.25		302158			302158
E302227	4.05		302227			302227
E302229	5.40		302229			302229
E302240	24.3		302240			302240
E302249	6.75		302249			302249
E302250	9.45		302250			302250
E302257	1.35		302257			302257
E302271	1.35-13.5		302271-M			302271-M
E302351	5.40		302351-M			302351-M
E302354	5.40		302354			302354
E302358	10.8		302358			302358
E302360	13.5		302360			302360
E302362	16.2		302362			302362
E302424	6.75		302424			302424
E302425	48.6		302425			302425
E302435	6.75		302435			302435
E302437	9.45		302437			302437
E302462	97.2		302462			302462
E302463	1.35		302463			302463
E302464	6.75		302464			302464
E302465	47.25		302465			302465
E302467	5.40		302467			302467
E302478	9.80		302478-M			302478-M
E302497	6.75		302497			302497
E302499	64.8		302499			302499
E302502	94.5		302502			302502
E302506	4.05-16.2		302506			302506
E302510	1.35		302510			302510
E302519	5.40		302519			302519
E302527	97.2		302527			302527
E302539	21.6		302539			302539
E302540	1.35		302540			302540
E302554	97.2		302554			302554
E302558	35.1, 64.8		302558			302558
E302579	29.7		302579			302579
E302580	27.0		302580			302580
E302589	21.6		302589			302589
E302642	7.00		302642-M			302642
E302651	1.35		302651			302651

"Eveready" Battery No.	"Philco"	"Ray-O-Vac"	"Sears"	"Ward"	"Wizard"	"Zenith"	*** Military
1662		166B					BA-206/U BA-236/U
2314							
2356							
2506		1601	6420				
2709							
2713							
2731							
2744							
2745							
2746							
2761							
2762							
2780							
E302125							
E302157							BA-1277/U
E302158							BA-1278/U
E302227							
E302229							
E302240							
E302249							
E302250							
E302257							
E302271							
E302351							
E302354							
E302358							
E302360							
E302362							
E302424							
E302425							
E302435							
E302437							
E302462							
E302463							
E302464							
E302465							
E302467							
E302478							
E302497							
E302499							
E302502							
E302506							
E302510							
E302519							
E302527							
E302539							
E302540							
E302554							
E302558							
E302579							
E302580							
E302589							
E302642							BA-1363/U
E302651							

"Eveready" Battery No.	Voltage	NEDA Number	"Burgess"	"RCA"	"Bright Star"	"Mallory"	
E302667	6.75		302667			302667	
E302702	2.70		302702			302702	
E302795	10.8		302795			302795	
E302800	75.6		302800			302800	
E302830	6.75-12.15		302830			302830	
E302896	1.35-9.45		302896-M			302896	
E302904	5.40		302904			302904	
E302905	6.75		302905			302905	
E302907	9.45		302907			302907	
E302908	10.8		302908			302908	
E303035	8.10		303035			303035	

*Discontinued numbers shown for reference only.

**NEDA number same as an "Eveready" battery number on a different battery.

***Corresponding commercial types may have dimensional and constructional differences from the Military types shown. However, they are usually dimensionally and electrically interchangeable.

"Eveready" Battery No.	"Philco"	"Ray-O-Vac"	"Sears"	"Ward"	"Wizard"	"Zenith"	*** Military
E302667 E302702 E302795 E302800 E302830							
E302896 E302904 E302905 E302907 E302908							
E303035							

UNITED STATES DEPARTMENT OF COMMERCE • Frederick H. Mueller, *Secretary*
NATIONAL BUREAU OF STANDARDS • A. V. Astin, *Director*

Specification for Dry Cells and Batteries

By

Sectional Committee on Dry Cells and Batteries—C18

Under the Sponsorship of the
National Bureau of Standards

Approved March 25, 1959, as American Standard, by the
American Standards Association (ASA designation C18.1–1959; UDC 621.352.7)

National Bureau of Standards Handbook 71

Issued December 29, 1959

(Supersedes Circular 559)

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.
Price 25 cents

Preface

The seventh edition of the American Standard Specification for Dry Cells and Batteries contained in this Handbook was approved as American Standard on March 25, 1959. It supersedes the previous specification, which was approved August 19, 1954, and published in Circular 559 of the National Bureau of Standards.

This new standard for dry cells and batteries marks the completion of another step in a project that was begun over 40 years ago. At that time the need for a governmental specification arose as a result of World War I. Since then, manufacturers of dry cells and large industrial users have cooperated with representatives of the Government in perfecting tests and specifications for the varied kinds of dry cells and batteries. This work has been accomplished through a Sectional Committee of the American Standards Association, acting under the sponsorship of the National Bureau of Standards.

New types of cells have been developed to meet new industrial needs and the available electrical output of better brands of the older types has been increased. Successive editions of this specification have reflected these changes. This edition of the specification includes for the first time specifications on cells and batteries for use with transistors; previous editions were confined to specifications for cells and batteries for use with vacuum-tube instruments. This edition of the specification also includes for the first time, dimensions in the metric and English systems and cell designations adopted by the International Electrotechnical Commission.

Advances in the dry-battery industry were made possible by the ability and willingness of battery manufacturers to improve the quality of their product and devise new methods of assembling the final units. The National Bureau of Standards cooperated with them in the tests, specifications, and some phases of research. The Bureau is pleased to have had a part in this work. The resulting benefits accrue to the Government and to the public alike. Future revisions of the specification will undoubtedly become necessary, as they have in the past, because the value of the specifications depends on their keeping pace with the advances made in the art.

A. V. Astin, *Director.*

History of the Project

In 1912, a committee[1] of the American Electrochemical Society recommended standard methods of testing dry cells. Although much has been accomplished in developing specifications for dry cells and batteries since that time, the influence of these early recommendations on some of the later specifications is still discernible.

The preparation of nationally recognized specifications to include sizes of cells, arrangement of batteries, tests, and required performance began in 1917 with the drafting of specifications which were later submitted by the National Bureau of Standards to a committee including representatives of manufacturers, the War Industries Board, and several government departments. The specifications which were approved at that time were published in 1919 as an appendix to the Bureau of Standards circular[2] on dry cells. Within a few years the need for revision became apparent and the Bureau was asked to call a conference of representatives of manufacturers, government departments, and some of the largest individual users of dry cells. This conference met in December 1921 and agreed on a standardization program for sizes of cells and batteries, tests, and performance. New specifications were published in the second edition of the Bureau of Standards' circular[3] on dry cells, and following their adoption as a government standard they were issued separately.[4]

In 1924 a committee consisting of representatives of the Government, battery manufacturers, and several large users of dry cells agreed on a standard system of nomenclature for dry cells and batteries. This has been used in subsequent revisions of the specifications. This committee initiated a movement for a more representative and permanent organization to deal with subsequent revisions of the dry-cell specifications with the result that the American Engineering Standards Committee (now the American Standards Association) authorized the formation of a sectional committee on dry cells under the sponsorship of the National Bureau of Standards. This committee has been active since its organization in 1926 and has prepared seven revisions of the specifications which became American Standards in 1928,[5] 1930,[6] 1937,[7] 1941,[8] 1947,[9] 1955,[10] and 1959.

Close cooperation was maintained between this sectional committee and the technical committee on dry cells reporting to the Federal Specifications Board until April 22, 1952 when the Federal Specification Boards were discontinued and since then with the General Services Administration, with the result that Federal specifications issued in 1931,[11] 1935,[12] 1948,[13] and 1954,[14] have been concordant with the American Standard specification, although differing in form. The 1935 specification anticipated many of the changes incorporated in the 1937 American Standard but did not include batteries intended primarily for use with hearing-aid devices. The Federal Specification was revised again in 1954.

---

[1] Trans. Am. Electrochem. Soc. c. 21, 275 (1912).

[2] Cir. BS 79, p. 39 (1919).

[3] Cir. BS 79, 2d ed., p. 54 (1923).

[4] Cir. BS 139 (1923); U.S. Government Standard Specification No. 58.

[5] Cir. BS 139, 2d ed. (1927); U.S. Government Master Specification No. 58a; ASA Standard C18-1928.

[6] Cir. BS 390 (1930); ASA Standard C18-1930.

[7] Cir. BS 414 (1937); ASA Standard C18-1937.

[8] Cir. NBS 435; ASA Standard C18-1941.

[9] Cir. NBS 466; ASA Standard C18-1947.

[10] Cir. NBS 559; ASA Standard C18.1-1954, UDC 621.352.7.

Periodic revision of the American Standard specifications becomes necessary as a result of changes in the art. New types and uses for batteries require the drafting of new specifications, and the improved performance of batteries, justifies some increase in the requirements. The new specifications, therefore, reflect the advances in the dry-battery industry, and this Handbook includes many new types of mercury cells and a complete revision in their nomenclature. One type given in the 1955 Specification has been eliminated and eleven new types have been added; this change reflects the great advance that has been achieved in mercury cells.

This Handbook, for the first time, contains dry cells and batteries for use with transistor circuits. Batteries for hearing aids are classified as A and B types for use with electron-tube instruments and as transistor types for use with transistor hearing-aid instruments. Transistor batteries for instruments other than hearing aids are also included in this Handbook. New tests have been designed to evaluate these new transistor batteries.

In recent years the use of the No. 6 dry cell in alarm systems has increased to the extent where a new standard test covering them became necessary. Accordingly, this Handbook includes a special test, designated as the alarm battery test, for evaluation of No. 6 dry cells.

Some of the advances made in the performance of batteries during the past years may be judged from the examples listed in the following paragraphs and taken from a paper by Gillingham.[15] Gillingham's performance figures relate to the better brands available at the time, but are not necessarily confined to the product of any particular manufacturer.

The spontaneous shelf deterioration of dry cells of the ordinary No. 6 size for general purposes, occurring in 6 months, was reduced from 35 percent in 1901 to 25 percent in 1916 and to 7 percent in 1934. Since the publication of Gillingham's paper in 1935, the shelf deterioration as observed from tests made during 1950–51 on a number of brands has been further reduced to about 2 percent. Since then no material change in the percentage of shelf deterioration has been noted.

The useful output of dry cells, measured by their service life on various tests, described in the accompanying specifications, has been materially increased. Cells of the telephone type, made in 1910, gave 155 days of service on the light intermittent test; those made in 1916 gave 165 days and the output was increased in 1926 to 230 days. About 1930, special grades of telephone cells became available giving 360 days, and some cells in 1934 reached 450 days. Since then no increases in service life have been noted.

In 1910, flashlight cells of the D size gave 260 minutes of service on the 4-ohm intermittent test whereas today, on the average, cells of this type give 675 minutes with some types giving 930 and 1,000 minutes.

---

[11] Federal Standard Stock Catalog, Specification Symbol W–B–101 (March 31, 1931).
[12] Federal Standard Stock Catalog, Specification Symbol W–B–101a (May 7, 1935).
[13] Federal Standard Stock Catalog, Specification Symbol W–B–101b (February 19, 1948).
[14] Federal Standard Stock Catalog, Specification Symbol W–B–101c (November 26, 1954).
[15] Trans Electrochem. Soc. 68, 159 (1935).

Industrial flashlight cells, intended for heavier service than the ordinary flashlight cells, appeared on the market about 1930, at which time they gave 250 minutes of service on the heavy-industrial test. Subsequent improvements were made rapidly, with the result that 975 minutes of service on the same test were obtainable from cells made in 1935. Results obtained since indicate that no appreciable change has taken place in connection with the heavy-industrial flashlight cell. However, some cells for light-industrial service give about 950 minutes of service.

Radio B batteries, which appeared about 1918, gave 377 hours on the 5,000-ohm continuous test, but in 1926, batteries containing the same size of cell gave 1,000 hours, and this was increased to 1,500 hours of service from batteries made in 1934. No further improvement in radio B batteries as observed on continuous tests have been recorded after 1934 because all continuous tests on B batteries were abolished and replaced by intermittent tests, which are more nearly representative of service conditions.

Hearing-aid A batteries (CD size) gave 18 hours of service in 1932. In 1935, similar batteries gave 50 hours of service whereas today 70 hours of service are obtained on the average. Some further developments have been made in hearing-aid B batteries, which are used with electron-tube-type instruments. These batteries are much smaller than any previously made and give good service at low current drains, even after six months of storage at normal temperatures.

These examples illustrate improvements that are the result of organized research and development on the part of the manufacturers and of standardized test procedures and specifications attained through cooperation of the groups represented on the sectional committee. To allow for manufacturing variations and to obtain adequate competition, it is necessary that the minimum required performance of the various types and sizes of cells included in the specifications be somewhat less than the maximum figures quoted above. The proportion of poorer brands on the market has decreased through the years. The result of all these factors has been a considerable gain to the public at large.

Personnel of Sectional Committee

The personnel of the Sectional Committee on Dry Cells and Batteries, C18 is as follows:

Organization Represented	*Name and Business Affiliation*
American Institute of Electrical Engineers.	W. B. Kouwenhoven, Johns Hopkins University, Baltimore 18, Md.
ASA Sectional Committee on Bioacoustics, S3.	S. F. Lybarger, E. A. Myers & Sons, Inc., 375 Valley Brook Road, Canonsburg, Pa. (Succeeding H. A. Carter, American Medical Society, Chicago, Ill.)
ASA Sectional Committee on Radio, C16.	F. T. Bowditch, National Carbon Co., Cleveland 1, Ohio.
Association of American Railroads, Communication Section.	H. A. Rappaport, Pennsylvania RR, 1034 Transportation Center, 6 Penn Center Plaza, Philadelphia 4, Pa. (Succeeding H. W. Burwell, Louisville & Nashville RR, Louisville 1, Ky.)
Association of American Railroads, Signal Section.	J. A. Balla, Pennsylvania RR, 594 Union Station, Chicago 6, Ill. (Succeeding T. T. Hart, Signal Engr., New York Central Railroad, Syracuse 3, N.Y.)
Bright Star Industries.	F. A. Keller, Bright Star Industries, Clifton, N.J.
Burgess Battery Co.	J. J. Coleman, Burgess Battery Company, Freeport, Ill.
Electrical Testing Laboratories.	H. C. Koenig, Electrical Testing Laboratories, Inc., New York 21, N.Y. Deceased.
The Electrochemical Society, Inc.	J. M. Booe, P. R. Mallory & Co., Inc., Indianapolis 6, Ind.
Electronics Industries Association.	W. S. Skidmore, Radio Corp. of America, Cherry Hill, Camden 8, N.J. (Succeeding L. M. Temple, Richard Puriton, Inc., Hamden, Conn.
Mallory Battery Co.	C. G. Birdsall, Mallory Battery Co., Cleveland, Ohio.
Marathon Battery Co.	G. H. Schroeder, Marathon Battery Co., Wausau, Wis.
National Bureau of Standards.	H. J. DeWane, W. J. Hamer (chairman of Committee), U.S. Department of Commerce, National Bureau of Standards, Washington 25, D.C.
National Carbon Co.	F. J. Wolfe (secretary of Committee), National Carbon Co., Cleveland 1, Ohio.
Ray-O-Vac Co.	R. E. Ramsay, Ray-O-Vac Co., Madison 10, Wis.
Telephone Group, ASA.	P. G. Uppstrom, Bell Telephone Laboratories, New York 14, N.Y.
Department of the Navy.	Department of Navy, Bureau of Ships, Code 350, Washington 25, D.C.
Member-at-Large.	W. B. Kouwenhoven, Johns Hopkins University, Baltimore 18, Md.

CONTENTS

Page

Preface ---- III
History of project ---- IV
1. Definitions ---- 1
2. Nomenclature ---- 1
3. Nominal voltage of dry batteries ---- 3
4. General classification of cells and batteries ---- 3
5. Standard sizes of cells and batteries ---- 3
6. Materials and workmanship ---- 7
7. Jackets ---- 7
8. Marking ---- 8
9. Top closure for cells and batteries ---- 8
10. Battery connections ---- 8
11. Terminals ---- 8
12. Voltage tests ---- 9
13. Capacity tests ---- 10
14. Required average performance ---- 14

Specifications for Dry Cells and Batteries

American Standard C18.1–1959

(Revision of C18.1–1954)

This seventh edition of American Standard Specification for Dry Cells and Batteries, American Standard C18, includes new tests, up-to-date data, and covers new types of dry cells. An alarm test with results on batteries suitable for alarm circuits is a new feature of this seventh edition of the specification. Performance data on flashlight batteries, radio batteries, hearing-aid batteries, etc., have been brought up-to-date. Batteries for use with transistors are included in this specification for the first time.

1. Definitions

1.1. Dry cells and batteries to be included under this specification shall have a nonspillable electrolyte and shall fulfill the requirements in other paragraphs of this specification.

2. Nomenclature

2.1. For reference in this specification, the following systems of nomenclature shall be used to designate sizes and types.

2.2. Cells listed and designated in tables 1A, 1B, and 2 are considered standard. These tables show nominal dimensions over the can for cylindrical cells, but the designations may apply also to cylindrical cells of other dimensions and to cells of other shapes, which, when used in assembled batteries, correspond approximately to the standard size in volume or electrical capacity rating. Such batteries shall be subject to standard dimensions and performance requirements.

TABLE 1A. *Sizes of Leclanche cylindrical cells*

Cell designation	Nominal dimensions [a]				Approximate volume		Approximate weight		IEC designation [b]
	Diameter		Can height						
	Inches	*Millimeters*	*Inches*	*Millimeters*	*Cubic inches*	*Cubic centimeters*	*Pounds*	*Grams*	
No. 6	2½	64	6	152	29. 5	484	2. 2	998	R–40
J	1¼	32	5⅞	149	7. 2	118	0. 6	272	R–27
G	1¼	32	4	102	4. 91	80	. 4	181	R–26
F	1¼	32	3 7/16	87	4. 22	69	. 35	159	R–25
E	1¼	32	2⅞	73	3. 53	58	. 29	132	R–22
D	1¼	32	2¼	57	2. 76	45	. 22	100	R–20
CD	1	25	3 3/16	81	2. 50	41	. 20	91	R–18
CL	15/16	24	2⅝	67	1. 81	30	. 13	59	R–15
C	15/16	24	1 13/16	46	1. 25	20	. 10	45	R–14
B	¾	19	2⅛	54	0. 94	15	. 077	35	R–12
BR	¾	19	1½	38	. 66	11	. 046	21	
BF	¾	19	1 5/16	33	. 58	10	. 040	18	R–10
A	⅝	16	1⅞	48	. 58	10	. 046	21	R–8
AA	17/32	13	1⅞	48	. 42	7	. 033	15	R–6
AAA	25/64	10	1 11/16	43	. 20	3	. 018	8. 2	R–03
R	17/32	13	1 5/16	33	. 291	5	. 023	10. 4	R–4
N	7/16	11	1 1/16	27	. 160	3	. 012	5. 4	R–1
NS	7/16	11	¾	19	. 113	2	. 009	4. 1	R–0

[a] Dimensions shown in International Electrotechnical Commission Publication 86—Recommendations for Primary Cells and Batteries—approximate the dimensions shown in this specification. IEC Publication 86 is available from the American Standards Association, Inc., 70 East 45 Street, New York 17, N.Y. at $3.00 per copy.

[b] These designations are given in IEC Publication 86.

TABLE 1B. *Sizes of mercury cylindrical cells*

Cell designation	Maximum dimensions [a]				Approximate volume		Approximate weight		IEC designation
	Diameter		Overall height						
	Inches	*Millimeters*	*Inches*	*Millimeters*	*Cubic inches*	*Cubic centimeters*	*Ounces*	*Grams*	
M10	0. 455	11. 56	0. 135	3. 42	0. 02	0. 3	0. 04	1. 1	
M12	. 495	12. 57	. 286	7. 26	. 06	1. 0	. 07	2. 0	
M15	. 455	11. 56	. 210	5. 33	. 03	0. 5	. 08	2. 3	
M20	. 615	15. 62	. 238	6. 05	. 07	1. 1	. 15	4. 3	MR-9
M25	. 455	11. 56	. 570	14. 48	. 09	1. 5	. 18	5. 1	MR-01
M30	. 625	15. 88	. 440	11. 18	. 13	2. 1	. 28	7. 9	
M35	. 470	11. 94	1. 130	28. 70	. 20	3. 3	. 40	11. 3	MR-1
M40	. 625	15. 88	0. 660	16. 76	. 20	3. 3	. 43	12. 2	MR-7
M50	. 640	16. 26	1. 140	28. 96	. 37	6. 1	. 78	22. 1	
M55	. 546	13. 87	1. 950	49. 53	. 46	7. 5	1. 05	29. 8	MR-6
M60	. 985	25. 02	0. 660	16. 76	. 50	8. 2	0. 93	26. 4	MR-17
M62	1. 195	30. 35	. 510	12. 95	. 57	9. 3	1. 20	34. 0	
M70	0. 625	15. 88	1. 950	49. 53	. 60	9. 8	1. 40	39. 7	MR-8
M72	1. 225	31. 12	0. 660	16. 76	. 78	12. 8	1. 60	45. 4	MR-19
M100	1. 281	32. 54	2. 390	60. 71	3. 08	50. 5	5. 85	165. 8	

[a] Dimensions shown in IEC Publication 86—Recommendations for Primary Cells and Batteries—approximate the dimensions shown in this specification.

TABLE 2. *Sizes of standard flat cells*

Cell designation	Nominal dimensions [a]						Approximate cross-sectional area		IEC designation
	Length		Width		Thickness				
	Inches	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*	*Square inches*	*Square centimeters*	
F15	9/16	14	9/16	14	0. 12	3. 0	0. 32	2. 1	F15
F20	15/16	24	17/32	13	. 11	2. 8	. 50	3. 2	F20
F25	57/64	23	57/64	23	. 23	5. 8	. 79	5. 1	F25
F30	1 1/4	32	27/32	21	. 13	3. 3	1. 05	6. 8	F30
F40	1 1/4	32	27/32	21	. 21	5. 3	1. 05	6. 8	F40
F50	1 1/4	32	1 1/4	32	. 14	3. 6	1. 56	10. 1	F50
F60	1 1/4	32	1 1/4	32	. 15	3. 8	1. 56	10. 1	F60
F70	1 45/64	43	1 45/64	43	. 22	5. 6	2. 90	18. 7	F70
F80	1 11/16	43	1 11/16	43	. 25	6. 4	2. 85	18. 4	F80
F90	1 11/16	43	1 11/16	43	. 31	7. 9	2. 85	18. 4	F90
F100	2 3/8	60	1 25/32	45	. 41	10. 4	4. 23	27. 3	F100

[a] Dimensions shown in IEC Publication 86—Recommendations for Primary Cells and Batteries—approximate the dimensions shown in this specification.

2.3 Assembled batteries are designated by a code system formulated as follows:

(1) The size of cell is indicated by the designations in tables 1A, 1B, and 2.

(2) Preceding the size designation is a numeral showing the number of cells (1.5- or 1.3-volt groups) in series in the battery. If no numeral appears, it is to be understood that the battery is a 1.5- or 1.3-volt battery.

(3) Following the cell-size designation is a numeral indicating the number of cells or groups of cells connected in parallel. If no such parallel-indicating numeral appears, it is to be understood that the battery consists of only a single series group. If there is a possibility of confusion between a cell designation and a parallel-indicating numeral, a dash shall be used to separate them. Thus, 15G2 will represent a 22.5-volt battery of 30 G–size cells connected in groups of 15 in series, 2 groups in parallel, and 15F100–2 will represent a 22.5-volt series parallel battery of 30F100–size cells.

(4) When a small letter "s" or "d" is used at the end of the code, it indicates either of two structural arrangements identical as to number and size of cells and electrical connections; "s" indicating a single, and "d" a double-row arrangement.

3. Nominal Voltages of Dry Batteries

Voltages in (volts) in common use for dry-battery combinations are as follows:

Leclanche	*Leclanche*	*Mercury*
1. 5	22. 5	1. 3
3	30	2. 6
4. 5	33	3. 9
6	45	5. 2
7. 5	67. 5	6. 5
9	90	7. 8
15	300	9. 1

4. General Classification of Cells and Batteries

4.1. The following classes of dry cells and batteries are included in this specification:

(a) General-purpose No. 6 dry cells.
(b) Industrial No. 6 dry cells.
(c) Telephone cells in No. 6, and D sizes.
(d) Assembled batteries of No. 6 cells.
(e) Group batteries of small cells, intended for No. 6 dry-cell applications.
(f) General-purpose flashlight cells.
(g) Industrial flashlight cells and batteries.
(h) Batteries for photoflash lamps.
(i) Batteries for electron tube and transistor hearing aids.
(j) A batteries.
(k) B batteries.
(l) C batteries.
(m) A/B pack batteries.
(n) Transistor batteries for devices other than hearing aids.

5. Standard Sizes of Cells and Batteries

5.1. *No. 6 dry cells.* The dimensions for the container of the cell measured without the jacket, are: diameter, 2½ inches (64 mm); height, 6 inches (152 mm). Deviations shall not exceed $\frac{1}{16}$ inch (1.6 mm) in diameter and ⅛ inch (3.2 mm) in height, from the dimensions as given. The overall dimensions, including the jacket and terminals, shall not exceed: height, 6¾ inches (171 mm); diameter, 2⅝ inches (67 mm).

5.2. *Assembled batteries of No. 6 cells.* Standard batteries of this class are shown with their required dimensions in table 3.

TABLE 3. *Assembled batteries of No. 6 cells*

Battery designation	Number of cells in series and arrangement	Nominal battery voltage	Maximum dimensions					
			Length		Width		Overall height	
		Volts	*Inches*	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*
4 No. 6s---	4 cells, single row------	6	10⅝	270	$2\frac{13}{16}$	71	7½	190
4 No. 6d---	4 cells, double row-----	6	5⅜	137	5⅜	137	7½	190
5 No. 6d---	5 cells, double row-----	7. 5	8	203	5⅜	137	7½	190
6 No. 6d---	6 cells, double row-----	9	8	203	5⅜	137	7½	190

5.3. *Group batteries of small cells (for No. 6 cell applications).* Cells contained in these batteries may be of various sizes, as preferred by the manufacturer. Batteries shall comply with the dimension requirements of table 4.

5.4. *Flashlight cells and batteries.* Those considered standard are listed in table 5, and shall comply with the dimensions shown therein.

5.5. *Batteries for hearing aids.* These batteries are of several groups, according to the type of instrument for which they are intended, and are so arranged in table 6. Such batteries shall comply with dimensions listed in the table. Codes referring to the various batteries are described in section 2.3.

5.6. *A batteries.* Standard types of A batteries are listed with dimension requirements in table 7. For descriptive code, see section 2.3. A batteries are designed to supply filament current for electron tubes.

5.7. *B batteries.* These batteries are for electron tube plate-current supply and are usually furnished in series-assembled units of 22.5 volts and multiples thereof, as shown in table 8.

5.8. *C batteries.* Standard types are listed with dimensions in table 9. They are intended to supply bias voltage to electron tubes.

TABLE 4. *Group batteries of small cells*

(No. 6 cell applications)

Nominal battery voltage	Maximum dimensions					
	Length		Width		Overall height	
Volts	*Inches*	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*
1. 5	2 5/8	67	2 5/8	67	6 1/4	159
3	4	102	2 3/4	70	6 1/4	159
4. 5	4	102	4	102	6 1/4	159
6	2 13/16	71	8 5/16	211	6 7/16	164
7. 5	4 1/16	103	7 5/16	186	6 7/16	164
9	4 1/16	103	8 9/16	217	6 7/16	164

TABLE 5. *Flashlight cells and batteries (with jackets)*

Cell or battery designation	Maximum dimensions [a]				Minimum dimensions [a]			
	Diameter		Overall height		Diameter		Overall height	
UNIT CELLS [b]								
	Inches	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*
D	1 11/32	34	2 13/32	61	1 9/32	33	2 5/16	59
C	1 1/32	26	1 31/32	50	31/32	25	1 7/8	48
BF	27/32	21	1 15/32	37	25/32	20	1 3/8	35
AA	9/16	14	1 31/32	50	17/32	13	1 29/32	48
AAA	13/32	10	1 3/4	44	3/8	10	1 11/16	43
N	29/64	12	1 3/16	30	27/64	11	1 9/64	29
LANTERN BATTERY								
4F	3 1/4 [c]	86	4 [d]	102	------	------	3 13/16	97

[a] See figure 6.
[b] Cells may be supplied as tubular batteries as follows if required: 2D, 3D, 2C, 2BF, 2AA.
[c] Maximum diagonal. This battery must pass through a cylinder 4 inches long and 3¼ inches in diameter.
[d] Height over body, exclusive of terminals.

TABLE 6. *Batteries for hearing aids*

Battery designation		Battery voltage (nominal)	Terminal arrangement	Maximum dimensions							
Cylindrical	Flat			Diameter		Length		Width		Overall height	
PART I. A BATTERIES FOR ELECTRON—TUBE INSTRUMENTS											
		Volts		*Inches*	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*
AA	--------	1.5	(b)	9/16	14	-----	----	-----	----	1 31/32	50
AA2	--------	1.5	(b)	----	----	1 9/64	29	19/32	15	2 1/64	51
A	--------	1.5	(b)	41/64	16	-----	----	-----	----	2	51
B	--------	1.5	(b)	3/4	19	-----	----	-----	----	2 3/16	56
C	--------	1.5	(b)	1 1/32	26	-----	----	-----	----	1 31/32	50
CL	--------	1.5	(b)	1 1/32	26	-----	----	-----	----	2 25/32	71
D	--------	1.5	(b)	1 11/32	34	-----	----	-----	----	2 13/32	61
CL	--------	1.5	I	1 3/32	28	-----	----	-----	----	3 7/16	87
CD	--------	1.5	I	1 1/8	29	-----	----	-----	----	4	102
F	--------	1.5	I	1 11/32	34	-----	----	-----	----	4 3/16	106
M40	--------	1.3	(b)	0.625	16	-----	----	-----	----	0.660	17
M50	--------	1.3	(b)	.640	16	-----	----	-----	----	1.140	29
M55	--------	1.3	(b)	.546	14	-----	----	-----	----	1.950	50
M60	--------	1.3	(b)	.985	25	-----	----	-----	----	0.660	17
M62	--------	1.3	(b)	1.195	30	-----	----	-----	----	.510	13
M70	--------	1.3	(b)	0.625	16	-----	----	-----	----	1.950	50
M72	--------	1.3	(b)	1.225	31	-----	----	-----	----	0.660	17
PART II. B BATTERIES FOR ELECTRON—TUBE INSTRUMENTS											
--------	10F15	15	(c)	-----	----	5/8	16	19/32	15	1 3/8	35
--------	15F15	22.5	(d)	-----	----	5/8	16	19/32	15	2	51
--------	20F15s	30	(e)	-----	----	5/8	16	19/32	15	2 39/64	66
--------	20F15d	30	(e)	-----	----	1 7/32	31	5/8	16	1 27/64	36
--------	10F20	15	XVI	-----	----	1 1/16	27	5/8	16	1 1/2	38
--------	15F20	22.5	XVI	-----	----	1 1/16	27	5/8	16	2	51
--------	20F20	30	XVI	-----	----	1 1/16	27	5/8	16	2 9/16	65
10NS	10F30	15	XVI	-----	----	1 3/8	35	1 1/16	27	1 9/16	40
15NS	15F30	22.5	XVI	-----	----	1 3/8	35	1 1/16	27	2 3/16	56
20NS	20F30	30	XVI	-----	----	1 3/8	35	1 1/16	27	2 13/16	71
15NS	15F30	22.5	VIII	-----	----	1 3/8	35	1 1/16	27	2 3/4	70
20NS	20F30	30	VIII	-----	----	1 3/8	35	1 1/16	27	3 3/8	86
15N	15F40	22.5	VIII	-----	----	1 13/32	36	1 1/16	27	4 1/32	102
22N	22F40	33	VIII	-----	----	2 21/32	67	1 1/16	27	3 1/8	79
30N	30F40	45	VIII	-----	----	2 21/32	67	1 1/16	27	4 1/32	102
PART III. BATTERIES FOR TRANSISTOR INSTRUMENTS											
M10	--------	1.3	(b)	0.455	12	-----	----	-----	----	0.135	3
M12	--------	1.3	(f)	.495	13	-----	----	-----	----	.286	7
M15	--------	1.3	(b)	.455	12	-----	----	-----	----	.210	5
N	--------	1.5	(b)	.453	12	-----	----	-----	----	1.188	30
M20	--------	1.3	(b)	.615	16	-----	----	-----	----	0.238	6
M25	--------	1.3	(b)	.455	12	-----	----	-----	----	.570	14
2M25	--------	2.6	(b)	.485	12	-----	----	-----	----	1.140	29
M35	--------	1.3	(b)	.470	12	-----	----	-----	----	1.130	29
2M35	--------	2.6	(e)	-----	----	0.990	25	0.515	13	1.227	31
M35-2	--------	1.3	(e)	-----	----	.990	25	.515	13	1.227	31
M40	--------	1.3	(b)	.625	16	-----	----	-----	----	0.660	17
2M40	--------	2.6	(b)	.662	17	-----	----	-----	----	1.315	33
2M40D	--------	2.6	(b)	.662	17	-----	----	-----	----	1.965	50
3M40	--------	3.9	(b)	.662	17	-----	----	-----	----	1.965	50
M40-2	--------	1.3	(b)	.657	17	-----	----	-----	----	1.320	34
5M40	--------	6.5	I	-----	----	1.375	35	.662	17	2.125	54

[a] Terminal designations in Roman numerals refer to terminals shown in figures 1 through 5.
[b] Flashlight-cell terminal.
[c] Flat projecting, one on each end.
[d] Flat recessed, one on each end.
[e] Flat projecting, both on top.
[f] Snap on.

TABLE 7. *A batteries*

Battery designation	Battery voltage (nominal)	Terminal arrangement [a]	Maximum dimensions					
			Length		Width		Overall height	
	Volts		*Inches*	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*
F2	1.5	I	2 5/8	67	1 3/8	35	4 1/4	108
F4d	1.5	I	2 5/8	67	2 5/8	67	4 1/8	105
F6d	1.5	I	3 15/16	100	2 3/4	70	4 1/8	105
F8d	1.5	I	3 15/16	100	2 3/4	70	5 1/2	140
3D	4.5	III	4	102	1 3/8	35	3	76
3F	4.5	III	4	102	1 7/16	37	4 1/8	105
3G	4.5	III	4	102	1 7/16	37	4 3/4	121
4Fd	6	IV	2 21/32	67	2 21/32	67	4 1/4	108
4F2s	6	IV	3 15/16	100	1 7/16	37	10 7/8	276

[a] Terminal designations in Roman numerals refer to terminals shown in figures 1 through 5.

TABLE 8. *B batteries*

Battery designation		Battery voltage (nominal)	Terminal arrangement [a]	Maximum dimensions					
Cylindrical	Flat			Length		Width		Overall height	
		Volts		*Inches*	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*
----------	15F20	22.5	XVI	1 1/16	27	5/8	16	2	51
----------	20F20	30	XVI	1 1/16	27	5/8	16	2 9/16	65
----------	45F25	67.5	XV [b]	1 59/64	49	1 1/64	26	5 9/16	141
----------	60F25	90	XV [b]	1 31/32	50	1 1/32	26	7 15/32	190
15NS	15F30	22.5	XVI	1 3/8	35	1 1/16	27	2 7/32	56
20NS	20F30	30	XVI	1 3/8	35	1 1/16	27	2 13/16	71
45NS	45F30	67.5	XV	2 13/16	71	1 3/8	35	2 1/2	64
30N	30F40	45	XV	2 21/32	75	1	25	3 3/4	95
45N	45F40	67.5	XV	2 13/16	71	1 3/8	35	3 13/16	97
60N	60F40	90	XV [c]	3 23/32	94	1 3/8	35	3 3/4	95
30AA	30F70	45	IX or X	3 1/8	79	2 3/8	60	4 3/16	106
15A	15F80	22.5	Screw	3 17/32	90	2 3/16	56	2 15/16	75
30A	30F80	45	IX or X	3 9/16	90	2 5/16	59	4 5/8	117
30BR	30F90	45	IX or X	3 5/8	92	1 27/32	47	5 5/8	143
15B	--------	22.5	XII	4 1/4	108	2 5/8	67	3 5/16	84
30B	--------	45	IX or X	4 3/8	111	2 11/16	68	5 1/2	140
----------	30F100	45	VII	5 1/8	130	2 1/16	52	7 1/4	184
30D	--------	45	VII	8 1/4	210	3 5/16	84	7 5/8	194
30F	--------	45	VII [d]	8 1/4	210	4 1/2	114	7 5/8	194
30G	--------	45	VII	8 1/4	210	4 9/16	116	7 11/16	195

[a] Terminal designations in Roman numerals refer to terminals shown in figures 1 through 5.
[b] Spacing for snap terminals to be 0.937±0.015 inches, center to center, instead of 1.5 inches as shown and terminals to be on center.
[c] Spacing for snap terminals to be 2.5±0.015 inches, center to center, instead of 1.5 inches as shown.
[d] May have spring clip terminal when specified.

TABLE 9. *C batteries*

Battery designation	Battery voltage (nominal)	Terminal arrangement [a]	Maximum dimensions					
			Length		Width		Overall height	
	Volts		*Inches*	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*
3B	4.5	Screw [b]	2 1/2	63	7/8	22	3 5/32	80
5B	7.5	(c)	4 1/4	108	15/16	24	3 5/16	84
15B	22.5	XII	4 1/4	108	2 5/8	67	3 1/16	78
3D	4.5	XI	4 1/16	103	1 1/2	38	3 1/16	78
200F20	300	XVIII	2 11/16	68	2 7/32	56	3 29/32	99

[a] Terminal designations in Roman numerals refer to terminals shown in figures 1 through 5.
[b] Screw or flat-spring type.
[c] One flexible wire at 7.5 volts and 5 screw terminals.

5.9. *A/B pack batteries.* Batteries in this classification comprise a suitable combination of A and B units assembled in a single battery. Standard types are listed with dimension requirements in table 10.

5.10. *Transistor batteries.* Standard types of transistor batteries are listed with dimensions in table 11. These batteries are designed to supply power to transistor circuits.

TABLE 10. *A/B Pack batteries*

Battery designation	Battery voltage (nominal)		Terminal arrangement [a]	Maximum dimensions					
	A	B		Length		Width		Overall height	
	Volts	*Volts*		*Inches*	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*
60AA/6CD	9, 7.5	90	XIV	8 7/8	225	2 1/8	54	3 25/32	96
60A/6F	9, 7.5	90	XIV	9 5/8	244	2 7/8	73	4 1/2	114
60BR/6G	9, 7.5	90	XIV	10 9/16	268	3 3/8	86	4 5/16	110
60D/F18	1.5	90	XIII	16	406	4 1/2	114	7 1/16	179

Terminal designations in Roman numerals refer to terminals shown in figures 1 through 5.

TABLE 11. *Transistor batteries*

Battery designation	Battery voltage (nominal)	Terminal arrangement [a]	Maximum dimensions							
			Diameter		Length		Width		Overall height	
	Volts		*Inches*	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*
AA	1. 5	([b])	9/16	14	------	----	------	----	1 31/32	50
C	1. 5	([b])	1 1/32	26	------	----	------	----	1 31/32	50
D	1. 5	([b])	1 11/32	34	------	----	------	----	2 13/32	61
6F25	9. 0	([c])	------	----	1	25	1	25	1 61/64	50
6F50-2	9. 0	XVII [d]	------	----	1 3/8	35	1 13/32	36	2 3/4	70
6F100	9. 0	XV [e]	------	----	2 9/16	65	2 1/32	52	3 5/32	80

[a] Terminal designations in Roman numerals refer to terminals shown in figures 1 through 5.
[b] Flashlight-cell terminal.
[c] One snap fastener terminal centered on each end of battery.
[d] Miniature snap fastener terminals spaced 1/2 ±0.010 inch apart on the top of battery and on center line.
[e] Snap fastener terminals spaced 1 3/4 ±0.010 inches apart on long center line and centered on top of battery

6. Material and Workmanship

6.1. Material and workmanship shall be first class in every particular. Cells or batteries having any of the following defects shall be considered as not complying with this part of the specification: Loose terminals, spring clips, or plug-in terminals that do not make and maintain positive connections to the external circuit, corrosion of terminals, loose or broken seals, leaking or distorted containers. Cells and assembled batteries shall be free from deformation and leakage during their useful life under specified test conditions (see section 13).

7. Jackets

7.1. Single No. 6 dry cells and flashlight type unit cells shall be enclosed in close-fitting jackets, usually of paperboard, but may be of plastic or other suitable material. For special purposes, jackets may be treated when so specified with paraffin or other water-proofing material. When metal-clad jackets are provided on unit cells, they shall be insulated from both terminals of the cell, and shall be covered outside with insulating material that is adherent and resistant to penetration by exposed metal switch parts of flashlights or other equipment in which the cells are used.

8. Marking

8.1. On the outside of the jackets of unit cells and outside of batteries, the following information shall be printed:

The trade name of the cell or battery.

The name or trade-mark of the manufacturer or supplier.

The type number or other designation of size.

The coded date of manufacture, or the expiration of a guaranty period, indicated as such. (Option: This may be shown on the individual cell container, provided the jacket is removable.)

Socket terminals shall be located on the top of the battery, and the polarity shall be clearly marked.

9. Top Closure for Cells and Batteries

9.1. Sealing compound used for closing cells and batteries at the top shall be an insulating material that will not flow at a temperature of 113° F (45° C) during a static test, in which the sealed surface is held vertical for a period of 24 hours.

9.2. Metal or composition covers for tops of cells may be used in lieu of sealing compound, provided such covers and accessory parts shall not become adversely affected by leakage, corrosion, or deformation during the useful life of the cell.

9.3. Metal boxes and covers of assembled batteries shall, unless otherwise specified, be insulated from the cells comprising the battery. The top closure may be metal, fiber, paperboard, sealing compound, or plastic.

10. Battery Connections

10.1. In all assembled batteries, electrical connections between cells, and between cells and terminals shall be secure and permanent.

10.2. All soldered connections shall be made in such a manner as not to interfere with subsequent battery performance.

10.3. Welded or solderless wrapped connections, where practicable, may be used in lieu of soldered connections, provided they are equally permanent.

11. Terminals

11.1. Terminals in common use for batteries of various classifications are as follows:

(a) KNURLED-NUT AND SCREW TERMINALS. These shall have standard 8–32 threads and shall be of brass or other suitable metal.

(b) SPRING-CLIP TERMINALS. These shall be of spring brass or other material of equivalent properties.

(c) FLASHLIGHT-CELL TERMINALS. In the case of flashlight cells, the metal cap on the carbon electrode and the bottom of the cell may serve as the terminals.

(d) FLAT- OR SPIRAL-SPRING TERMINALS. These terminals shall consist of either flat-metal strips or spirally-wound wire, in a form suitable to provide a pressure contact. They shall be made of spring brass, or other metal of equivalent properties.

(e) WIRE TERMINALS. These shall be flexible insulated tinned copper conductor and may be covered with single cotton braid or suitable plastic if so specified. The positive terminal wire covering shall be red and the negative, black. Unless otherwise specified, the size of wire shall be equivalent to No. 18 (AWG), and the length shall be 6 ±½ inches. When the free ends of wire terminals are stripped bare, the separate strands shall be soldered together at the tip. Under certain circumstances wire terminals may be required to terminate with a ring, open-ring, soldering lug, or other type of connector.

(f) "PLUG-IN" SOCKETS. This type of terminal shall consist of a suitable assembly of metal contacts, mounted in an insulating housing or holder and adapted to receive corresponding pins of a mating plug in such manner as to make good electrical contact. The metal contacts shall be of tinned brass or other equally suitable metal. Dimensions and arrangement of socket contacts shall be in conformity with figures 1 and 2 for various voltages as required and not exceeding 100 volts. For high-voltage batteries, such as the battery designated 200F20, the terminals shall be of the flush pin jack type with spacing and marking as shown in figure 5, XVIII. These terminals are located on top of the battery on a center line through the sockets 9/16 inch from the front of the battery.

(g) SNAP-FASTENER TERMINALS. This type of terminal consists of a combination comprising a stud for the positive and a socket for the negative terminal, as illustrated in figures 3 and 5. These shall be made from tinned brass or other suitable metal. They shall be designed in such a way as to provide a secure electrical connection when fitted with corresponding parts for connection to an electrical circuit.

(h) FLAT CONTACT TERMINALS. These shall be essentially a flat metal surface, as shown in figure 4, or as recommended in footnotes c, d, and e of table 6, adapted to make electrical contact by suitable contacting mechanisms bearing against them. In the subminiature hearing-aid B batteries, all flat terminals shall project beyond the body of the battery, except in the case of the battery designated 15F15, where the flat terminals shall be recessed. This is done to avoid the possible error of interchanging this B battery and the A battery (size AA) in a hearing-aid instrument.

11.2. *No. 6 cells.* These shall be equipped with terminals of either the knurled-nut and screw type or with spring clips, as required. Spacing between centers of screw terminals shall be 1 1/16 ± 1/16 inch. In the case of spring-clip terminals the design and location of the negative terminal shall be such that no part of it will extend outside the periphery of the jacket when the connecting wire is in place.

11.3. *Assembled batteries of No. 6 cells* (*table 3*). These shall be equipped with terminals of either the knurled-nut and screw, or spring-clip type as required. Terminals shall be located on the top of the battery and the polarity of each shall be clearly marked.

11.4. *Group batteries of small cells* (*table 4*). These batteries shall have terminals similar to those used on No. 6 dry cells.

11.5. *Flashlight cells* (*table 5*). Terminals for these shall be as described in 11.1(c). The positive terminal shall be centrally located at the top of the cell and the negative shall be centrally located at the bottom. They shall be clean to assure good electrical contact.

11.6. *Lantern batteries* (*table 5*). Terminals shall be of flat- or spiral-spring type brought out through the cover at the top. The point of contact of one terminal shall be centrally located and that of the other 1 ± 1/16 inch from it. The polarity of each shall be clearly marked.

11.7. *Hearing-aid batteries.* Terminals for hearing-aid batteries shall be as specified in table 6. It is especially important in hearing-aid batteries that the terminals be such that good contact is maintained at all times with the instrument terminals in order to avoid noise and unsatisfactory reception and that they shall preferably be of such design that reversal of polarity is impossible.

11.8. *A, B, C batteries, A/B Pack batteries and transistor batteries* (*tables 7, 8, 9, 10 and 11*). Terminals for these batteries shall be as called for in the tables.

12. Voltage Tests

12.1 Voltage tests are intended to apply to fresh cells or batteries and shall be made within 30 days of receipt of samples by the testing agency. The samples shall have been subjected to a temperature of 70 ±2° F (21° C) for a long enough period (at least 24 hours) to have become stabilized at this temperature before the measurements are made.

12.2. The voltmeter used shall meet the following requirements:

(a) The voltmeter shall have an accuracy at least of 0.5 percent of full-scale deflection. The resistance shall be 1,000 ohms per volt of full-scale deflection for cells larger than F20, and 10,000 ohms per volt or higher for cells of F20 size or smaller.

(b) When used to measure individual cells, the scale shall have not less than 50 divisions per volt.

(c) When used to measure batteries of two or more cells, the scale shall have not less than 100 divisions, and the full-scale reading shall preferably be about 2 volts per cell in series and shall not exceed 5 volts per cell.

(d) When measured under the above conditions the voltage of the cell or battery shall equal or be greater than the specified nominal voltage.

13. Capacity Tests

13.1. The size and kind of dry cell or battery and the conditions of service determine the kind of test to be applied. The test that best represents any particular service is that which most nearly duplicates the power output of the battery when in actual use. Intermittent tests are preferred to continuous tests and shall be used whenever possible because they usually simulate service conditions more closely. Generally, there is no direct relation between the results of continuous and intermittent tests.

"Initial" tests intended to show the condition of fresh batteries shall be started within 30 days of the receipt of the batteries by the testing agency. All tests not otherwise designated shall be understood to be "initial" tests.

"Delayed" tests are intended to measure the keeping quality of cells and batteries. Cells and batteries for delayed test shall be stored on open circuit at an even temperature of 70±2° F (21° C) for the time specified in section 14. The storage time specified shall be measured from the time at which the batteries were received by the testing agency.

The standard temperature for tests is 70 ±2° F (21° C) unless otherwise specified. Deviations from this temperature shall be stated.

The resistance of the discharge circuit shall be maintained within 0.5 percent of its nominal value.

In making capacity tests, readings of the closed-circuit voltage shall be taken with a voltmeter conforming to the requirements of paragraph 12.2.

To determine compliance with this Specification, those tests shall be applied for which requirement data are given in tables 11 to 21, inclusive.

In the tests described below, the frequency of readings specified for each test relates to the larger and more commonly used sizes of cells and batteries. When the smaller sizes are tested, more frequent readings are required.

13.2 *Description of Tests.*

(1) LIGHT INTERMITTENT TEST. Three cells connected in series shall be discharged through a resistance of 20 ohms for 10 periods of 4 minutes each, beginning at hourly intervals during 6 days per week. On the remaining day, every other discharge period shall be omitted. (There are 65 such discharge periods per week, or a total weekly service of 260 minutes).

The following readings shall be taken: Initial open-circuit voltage of the battery, initial closed-circuit voltage, and the closed-circuit voltage at the end of the 10th discharge of each succeeding 7th day.

The test shall be continued until the closed-circuit voltage of the battery falls below 2.8 volts. The service shall be reported as the number of days on test before battery voltage falls below 2.8 volts.

(2) FIFTY-OHM TELEPHONE TEST. This test shall be conducted exactly as called for in section (1) above, except that the three cells shall be discharged through 50 instead of 20 ohms, and the cutoff voltage shall be 3.25 instead of 2.8 volts.

(3) ALARM BATTERY TEST. The battery shall be discharged continuously through a resistance of 300 ohms for each cell in series.

The following readings shall be taken: Initial open-circuit voltage of the battery; initial closed-circuit voltage, and the closed-circuit voltage at the end of each 7 days of service.

The test shall be continued until the closed-circuit voltage falls below 0.90 volt per cell. The service shall be reported as the total number of days on test before battery voltage falls below 0.90 volt per cell.

(4) HEAVY INTERMITTENT TEST. The battery shall be discharged through a resistance of 2⅔ ohms for each cell in series for two periods of 1 hour each daily according to the following schedule:

1-hour discharge. 6-hour rest. 1 hour discharge. 16-hour rest.

The following readings shall be taken: Initial open-circuit voltage of the battery; initial closed-circuit voltage, and the closed-circuit voltage every alternate working day thereafter at the end of the second discharge period of the day.

The test shall be continued until the closed-circuit voltage of the battery falls below 0.85 volt per cell. The service shall be reported as the number of hours of discharge before battery voltage falls below 0.85 volt per cell.

(5) GENERAL-PURPOSE 5-OHM INTERMITTENT TEST. Each cell shall be discharged through a resistance of 5 ohms for 5-minute periods at 24-hour intervals.

The following readings shall be taken: Initial open-circuit voltage of the cell; initial closed-circuit voltage, and the closed-circuit voltage at the end of each discharge period.

The test shall be continued until the closed-circuit voltage of the cell falls below 0.75 volt. The service shall be reported as the number of minutes of discharge before the cell voltage falls below 0.75 volt.

(6) GENERAL-PURPOSE 4-OHM INTERMITTENT TEST. Each cell shall be discharged through a resistance of 4 ohms for 5-minute periods at 24-hour intervals.

The following readings shall be taken: Initial open-circuit voltage of the cell; initial closed-circuit voltage, and the closed-circuit voltage at the end of a discharge period twice each week thereafter.

The test shall be continued until the closed-circuit voltage of the cell falls below 0.75 volt. The service shall be reported as the number of minutes of discharge before the cell voltage falls below 0.75 volt.

(7) GENERAL-PURPOSE 2.25-OHM INTERMITTENT TEST. Each cell shall be discharged through a resistance of 2.25 ohms for 5-minute periods at 24-hour intervals.

The following readings shall be taken: Initial open-circuit voltage of the cell; initial closed-circuit voltage, and the closed-circuit voltage at the end of a discharge period twice each week thereafter.

The test shall be continued until the closed-circuit voltage of the cell falls below 0.65 volt. The service shall be reported as the number of minutes of discharge before the cell voltage falls below 0.65 volt.

(8) LIGHT-INDUSTRIAL FLASHLIGHT CELL TEST. Each cell shall be discharged through a resistance of 4 ohms for 4-minute periods, beginning at hourly intervals for 8 consecutive hours each day, with 16-hour rest periods intervening. (There are eight such discharge periods each day, or a total daily discharge of 32 minutes.)

The following readings shall be taken: Initial open-circuit voltage of the cell; initial closed-circuit voltage, and the closed-circuit voltage daily at the end of the last discharge period.

The test shall be continued until the closed-circuit voltage of the cell falls below 0.90 volt. The service of general-purpose flashlight cells shall be reported as the number of minutes of discharge before the cell voltage falls below 0.90 volt. The service of industrial flashlight cells shall be reported as the number of minutes of discharge before the cell voltage falls below 1.10 and 0.90 volts.

(9) HEAVY-INDUSTRIAL FLASHLIGHT CELL TEST. Each cell shall be discharged through a resistance of 4 ohms for 4-minute periods, beginning at 15-minute intervals, for 8 consecutive hours every day, with 16-hour rest periods intervening. (There are 32 such discharge periods each day, or a total daily discharge of 128 minutes.)

The following readings shall be taken: Initial open-circuit voltage of the cell; initial closed-circuit voltage; and the closed-circuit voltage at the end of the 16th and 32d discharge periods daily.

The test shall be continued until the closed-circuit voltage of the cell falls below 0.90 volt. The service shall be reported as the number of minutes of discharge before the cell voltage falls below 1.10 and 0.90 volts.

(10) PHOTOFLASH CELL TEST. Each cell shall be discharged through a resistance of 0.15 ohm for 1 second each minute for 1 hour (one discharge per minute) at 24-hour intervals for 5 consecutive days each week.

The following readings shall be taken: Initial open-circuit voltage of the cell; the closed-circuit voltage on the 1st, 30th and 60th discharge daily.

The test shall be continued until the closed-circuit voltage of the cell falls below 0.50 volt for a D-size cell and 0.25 volt for AA-size and C-size cells. The service shall be reported as the number of seconds of discharge before the cell voltage falls below, respectively, 0.50 and 0.25 volt.

(11) 32-OHM LANTERN BATTERY TEST. The battery shall be discharged every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours, through a resistance of 32 ohms.

The following readings shall be taken: Initial open-circuit voltage of the battery; initial closed-circuit voltage; and the closed-circuit voltage daily thereafter, at the end of the last discharge period of the day.

The test shall be continued until the closed-circuit voltage of the battery is below 3.6 volts. The service shall be reported as the number of hours of discharge before the battery voltage falls below 3.6 volts.

(12) 16 OHM LANTERN BATTERY TEST. The battery shall be discharged every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours, through a resistance of 16 ohms.

The following readings shall be taken: Initial open-circuit voltage of the battery; initial closed-circuit voltage; and the closed-circuit voltage daily thereafter, at the end of the last discharge period of the day.

The test shall be continued until the closed-circuit voltage of the battery is below 3.0 volts. The service shall be reported as the number of hours of discharge before the battery voltage falls below 3.0 volts.

(13) HEARING-AID A-BATTERY TEST, 20 OHMS. The battery shall be discharged through a resistance of 20 ohms for each cell in series, for one continuous 12-hour period each day.

The following readings shall be taken: Initial open-circuit voltage of the battery; initial closed-circuit voltage; and the closed-circuit voltage at the end of each 12-hour period of discharge, with readings during the discharge period, if necessary, to determine accurately the end of the test.

The test shall be continued until the closed-circuit voltage falls below 0.90 volt per cell. The service shall be reported as the number of hours of discharge before the battery voltage falls below 0.9 volt per cell.

(14) HEARING-AID A-BATTERY TEST, 30 OHMS. This test shall be as specified in paragraph (13) of section 13.2, with the exception that 30 ohms shall be used in place of 20 ohms.

(15) HEARING-AID A-BATTERY TEST, 50 OHMS. This test shall be as specified in paragraph (13) of section 13.2, with the exception that 50 ohms shall be used in place of 20 ohms.

(16) HEARING-AID B-BATTERY TEST, 1,500 OHMS. The battery shall be discharged through a resistance of 1,500 ohms for each cell in series for one continuous 12-hour period each day. The following readings shall be taken: Initial open-circuit voltage of the battery; initial closed-circuit voltage; and the closed-circuit voltage at the end of each discharge period.

The test shall be continued until the closed-circuit voltage falls below 1.0 volt per cell. The service shall be reported as the number of hours of discharge before the battery voltage falls below 1.0 volt per cell.

(17) HEARING-AID B-BATTERY TEST, 3,000 OHMS. This test shall be as specified in paragraph (16) of section 13.2, with the exception that 3,000 ohms shall be used in place of 1,500 ohms.

(18) HEARING-AID B-BATTERY TEST, 6,000 OHMS. This test shall be as specified in paragraph (16) of section 13.2, with the exception that 6,000 ohms shall be used in place of 1,500 ohms.

(19) HEARING-AID TRANSISTOR BATTERY TEST, 250 OHMS. The battery shall be discharged through a resistance of 250 ohms for each cell in series, for one continuous 12-hour period each day.

The following readings shall be taken: Initial open-circuit voltage of the battery; initial closed-circuit voltage; the closed-circuit voltage at the end of each 12-hour period of discharge, with readings during the discharge period, if necessary, to determine accurately the end of the test.

The test shall be continued until the closed-circuit voltage falls below 0.90 volt per cell. The service shall be reported as the number of hours of discharge before the battery voltage falls below 0.90 volt per cell.

(20) HEARING-AID TRANSISTOR BATTERY TEST, 625 OHMS. This test shall be as specified in paragraph (19) of section 13.2 with the exception that 625 ohms shall be used in place of 250 ohms.

(21) A-BATTERY TEST, 5 OHMS. Each complete 1.5-volt battery shall be discharged through a resistance of 5 ohms, during a continuous period of 4 hours daily.

The following readings shall be taken: Initial open-circuit voltage of the battery; initial closed-circuit voltage; closed-circuit voltage at the end of alternate discharge periods.

The test shall be continued until the closed-circuit voltage falls below 1.0 volt. The service shall be reported as the number of hours of discharge before the battery voltage falls below 1.1 and 1.0 volts.

(22) A-BATTERY TEST, 25 OHMS. Each complete battery shall be discharged through a resistance of 25 ohms for each 1.5 volts of nominal battery voltage during a continuous period of 4 hours daily.

The following readings shall be taken: Initial open-circuit voltage of the battery; initial closed-circuit voltage; closed-circuit voltage at the end of alternate discharge periods.

The test shall be continued until the closed-circuit voltage falls below 1.0 volt per cell in series in the battery. The service shall be reported as the number of hours of discharge before the battery voltage falls below 1.1 and 1.0 volts per cell.

(23) B-BATTERY TEST, 1,250 OHMS. Each 22.5-volt (nominal voltage) battery unit shall be discharged through a resistance of 1,250 ohms during a continuous period of 4 hours daily, the intervals between successive discharge periods being not less than 16 hours. For batteries other than 22.5-volt batteries, the resistance shall be 1,250 times the nominal battery voltage, divided by 22.5.

The following readings shall be taken: Initial open-circuit voltage of the battery; initial closed-circuit voltage; closed-circuit voltage at the end of alternate discharge periods.

The test shall be continued until the closed-circuit voltage falls below 15 volts, or the nominal voltage divided by 1.5. The service shall be reported as the number of hours of discharge before the battery voltage falls below 15 volts, or the nominal voltage divided by 1.5.

(24) B-BATTERY TEST, 2,500 OHMS. This test shall be as specified in paragraph (23) of Section 13.2 with the exception that 2,500 ohms shall be used in place of 1,250 ohms.

(25) B-BATTERY TEST, 22,500 OHMS. This test shall be as specified in paragraph (23) of section 13.2 with the exception that 22,500 ohms shall be used in place of 1,250 ohms.

(26) C-BATTERY TEST. The C batteries shall be stored on open circuit at a temperature of 70°±2° F. Voltage readings shall be taken at intervals not exceeding 1 month.

The test shall continue until the open-circuit voltage falls below 1.45 volts per cell. The service shall be reported as the number of months until the battery voltage falls below 1.45 volts per cell.

(27) A/B-PACK BATTERY TESTS. A/B-pack batteries shall be subjected to the same test for their A and B sections as are applicable, respectively, to separate A and B batteries of the same cell sizes. The service shall be reported as the number of hours of discharge until the

battery voltage falls below 1.0 volt per cell in series for the A section or below 15 volts per 22.5 volt unit for the B section, whichever is the smaller number.

(28) TRANSISTOR BATTERY TEST, 83⅓ OHMS. Each complete battery shall be discharged through a resistance of 83⅓ ohms for each 1.5 volts of nominal battery voltage during a continuous period of 4 hours daily.

The following readings shall be taken: Initial open-circuit voltage of the battery; initial closed-circuit voltage; closed-circuit voltage at the end of alternate discharge periods.

The test shall be continued until the closed-circuit voltage falls below 0.9 volt per cell in series in the battery. The service shall be reported as the number of hours of discharge before the battery voltage falls below 0.9 volt per cell in series.

(29) TRANSISTOR BATTERY TEST, 166⅔ OHMS. This test shall be as specified in paragraph (28) of Section 13.2 with the exception that 166⅔ ohms shall be used in place of 83⅓ ohms.

14. Required Average Performance

Batteries and cells of the various types and sizes shall comply with the performance requirements listed in tables 12 to 21, inclusive, as indicated below:

	Table
(a) No. 6 dry cells	12
(b) Group batteries of small cells intended as equivalent to No. 6 cells shall meet the requirements shown for the corresponding type of No. 6 cell in	12
(c) General-purpose flashlight cells	13
(d) Industrial flashlight cells and batteries	14
(e) Photoflash cells	15
(f) Hearing-aid batteries	16
(g) A batteries	17
(h) B batteries	18
(i) C batteries	19
(j) A/B pack batteries	20
(k) Transistor batteries	21

TABLE 12. *No. 6 Dry cells or equivalent and cells for telephone applications*

Sizes and types	Light intermittent test (1)[c]	50-ohm telephone test (2)	Alarm battery test (3)	Heavy intermittent test (4)	
				Initial	6-month delayed
	Days	*Days*	*Days*	*Hours*	*Hours*
No. 6 general-purpose[a]	200	------	------	70	65
No. 6 industrial[b]	310	500	------	100	90
No. 6 alarm	------	------	300	------	------
No. 6 "regular" telephone	300	470	------	------	------
No. 6 "special" telephone	340	625	------	------	------
Size D telephone	30	60	------	------	------

[a] Cells not otherwise specifically marked or represented by the manufacturer shall be considered as general purpose cells and tested according to the requirements thereof.

[b] This type of cell is intended for applications where highly efficient performance is required on both heavy and light services.

[c] These numbers in this and succeeding tables refer to the numbered test procedures given in section 13, Capacity Tests.

TABLE 13. *General-purpose flashlight cells*

Cell designation	General-purpose 2.25-ohm intermittent test (7)		General-purpose 4-ohm intermittent test (6)		General-purpose 5-ohm intermittent test (5)		Light industrial test (8)
	Initial	6-month delayed	Initial	6-month delayed	Initial	6-month delayed	
	Minutes	*Minutes*	*Minutes*	*Minutes*	*Minutes*	*Minutes*	*Minutes*
D	400	375	675	625	------	------	600
C	------	------	325	275	------	------	------
AA	------	------	80	65	------	------	------
AAA	------	------	------	------	50	40	------
N	------	------	------	------	45	35	------

TABLE 14. *Industrial flashlight cells and batteries*

Type designation	Industrial tests (8), (9)				Lantern tests			
	Initial		3-month delayed		16-ohm (12)		32-ohm (11)	
	1.1 Volts	0.9 Volt	1.1 Volts	0.9 Volt	Initial	6-month delayed	Initial	6-month delayed
	Minutes	*Minutes*	*Minutes*	*Minutes*	*Hours*	*Hours*	*Hours*	*Hours*
D, heavy-industrial	300	750	200	650	----	----	----	----
D, light-industrial	550	850	450	750	----	----	----	----
4F, lantern	----	----	----	----	20	15	45	40

TABLE 15. *Photoflash cells*

Cell designation	Photoflash test (10)	
	Initial	6-month delayed
	Seconds	*Seconds*
D	800	650
C	700	550
AA	150	120

TABLE 16. *Hearing-aid Batteries*

PART I. A BATTERIES

Classification and type designation		20-ohm test (13)		30-ohm test (14)		50-ohm test (15)	
Cylindrical	Flat	Initial	6-month delayed	Initial	6-month delayed	Initial	6-month delayed
		Hours	*Hours*	*Hours*	*Hours*	*Hours*	*Hours*
AA	------	------	------	------	------	30	25
A	------	------	------	18	16	45	40
AA2	------	------	------	35	25	75	60
B	------	12	8	25	20	------	------
C	------	15	10	35	25	------	------
CL	------	35	30	70	60	------	------
CD	------	70	65	130	120	------	------
D	------	70	65	130	120	------	------
F	------	120	110	220	200	------	------
M40	------	------	------	------	------	40	35
M50	------	25	20	40	30	70	65
M55	------	30	25	55	50	95	90
M60	------	------	------	50	45	95	90
M62	------	30	25	55	50	95	90
M70	------	55	50	85	80	140	130
M72	------	50	40	80	70	135	125

PART II. B BATTERIES

Classification and type designation		1,500-ohm test (16)		3,000-ohm test (17)		6,000-ohm test (18)	
Cylindrical	Flat	Initial	6-month delayed	Initial	6-month delayed	Initial	6-month delayed
------	10F15	------	------	125	100	250	200
------	15F15	------	------	125	100	250	200
------	20F15s	------	------	125	100	250	200
------	20F15d	------	------	125	100	250	200
------	10F20	100	90	200	175	400	350
------	15F20	100	90	200	175	400	350
------	20F20	100	90	200	175	400	350
10NS	10F30	300	250	600	500	------	------
15NS	15F30	300	250	600	500	------	------
20NS	20F30	300	250	600	500	------	------
15N	15F40	525	475	950	900	------	------
22N	22F40	525	475	950	900	------	------
30N	30F40	525	475	950	900	------	------

PART III. TRANSISTOR BATTERIES

Classification and type designation		250-ohm test (19)		625-ohm test (20)	
Cylindrical	Flat	Initial	6-month delayed	Initial	6-month delayed
		Hours	*Hours*	*Hours*	*Hours*
M10	------	------	------	30	25
M12	------	------	------	60	55
M15	------	------	------	80	75
N	------	65	55	160	150
M20, 2M20	------	60	55	160	155
M25, 2M25	------	60	55	160	155
M30, 3M30	------	95	90	------	------
M35, 2M35	------	145	140	------	------
M40, 2M40, 3M40	------	195	190	------	------
M35–2	------	290	280	------	------
M40–2	------	390	380	------	------

TABLE 17. *A batteries*

Battery designation	5-ohm test (21)				25-ohm test (22)			
	Initial		6-month delayed		Initial		6-month delayed	
	1.1 volts	1.0 volt	1.1 volts	1.0 volt	1.1 volts[a]	1.0 volt[a]	1.1 volts[a]	1.0 volt[a]
	Hours	*Hours*	*Hours*	*Hours*	*Hours*	*Hours*	*Hours*	*Hours*
F2	30	35	26	30	----	----	----	----
F4d	90	115	85	110	----	----	----	----
F6d	140	170	135	165	----	----	----	----
F8d	190	235	185	230	----	----	----	----
3D	----	----	----	----	50	70	40	60
3F, 4Fd	----	----	----	----	120	140	110	130
3G	----	----	----	----	140	170	130	160
4F2s	----	----	----	----	240	325	230	310

[a] Cutoff voltage stated as volts per cell or 1.5-volt group in series.

TABLE 18. *B batteries*

Battery designation		Test to be applied for 22.5-volt unit (23), (24), (25)	Initial	6-month delayed
Cylindrical	Flat			
			Hours	*Hours*
----	15F20, 20F20	22,500-ohm	100	90
----	45F25, 60F25	2,500-ohm	30	25
15NS, 30NS, 45NS	15F30, 30F30, 45F30	22,500-ohm	300	250
30N, 45N, 60N	30F40, 45F40, 60F40	22,500-ohm	525	475
30N, 45N, 60N	30F40, 45F40, 60F40	2,500-ohm	30	25
30AA	30F70	2,500-ohm	75	60
15A, 30A	15F80, 30F80	2,500-ohm	130	120
30BR	----	2,500-ohm	160	140
15B, 30B	30F90	2,500-ohm	225	210
30D	30F100	2,500-ohm	600	560
30F	----	1,250-ohm	550	500
30G	----	1,250-ohm	600	550

TABLE 19. *C batteries*

Battery designation	C-battery test (26)
	Months
3B, 5B, 15B	24
3D	36
200F20	12[a]

[a] Open-circuit voltage measurements to be made with a voltmeter having a resistance of at least 10,000 ohms per volt.

TABLE 20. *A/B pack batteries*

Battery designation	Test applied (27)	Initial	6-month delayed
		Hours [a]	*Hours* [a]
60AA/6CD	A 25-ohm test	75	60
	B 2,500-ohm test		
60A/6F	A 25-ohm test	130	120
	B 2,500-ohm test		
60BR/6G	A 25-ohm test	160	140
	B 2,500-ohm test		
60D/F18	A 5-ohm test	600	560
	B 2,500-ohm test		

[a] To 1.0 volt for each 1.5 volts of nominal A-battery voltage or to 15 volts of each nominal 22.5 volts of B battery.

TABLE 21. *Transistor batteries*

Battery designation		Test to be applied for each 1.5-volt unit (28), (29)	Initial	6-month delayed
Cylindrical	Flat			
			Hours	*Hours*
AA		166⅔ ohms	75	60
C		83⅓ ohms	130	120
D		83⅓ ohms	300	290
	6F25	166⅔ ohms	30	25
	6F50–2	166⅔ ohms	155	145
	6F100	83⅓ ohms	300	290

Figure 1.

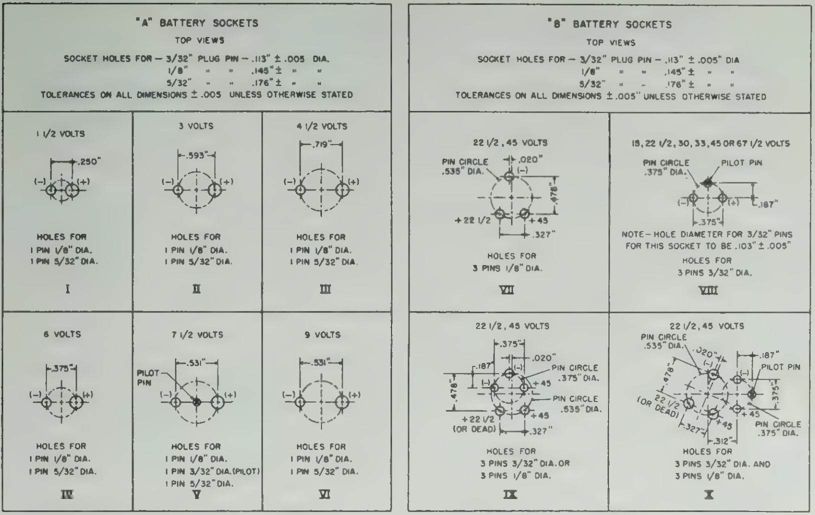


Figure 2.

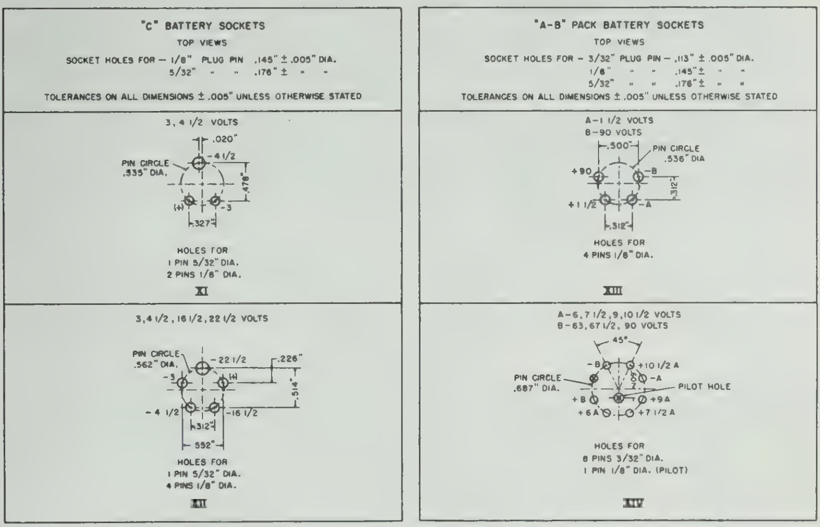


FIGURE 3.

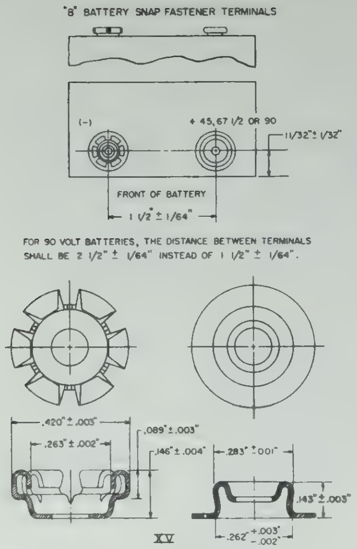


FIGURE 4.

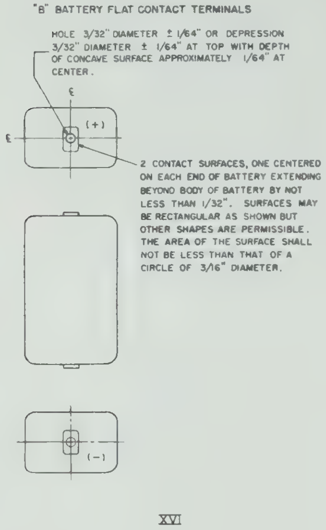

"B" BATTERY FLAT CONTACT TERMINALS
HOLE 3/32" DIAMETER ± 1/64" OR DEPRESSION 3/32" DIAMETER ± 1/64" AT TOP WITH DEPTH OF CONCAVE SURFACE APPROXIMATELY 1/64" AT CENTER.
℄
(+)
2 CONTACT SURFACES, ONE CENTERED ON EACH END OF BATTERY EXTENDING BEYOND BODY OF BATTERY BY NOT LESS THAN 1/32". SURFACES MAY BE RECTANGULAR AS SHOWN BUT OTHER SHAPES ARE PERMISSIBLE. THE AREA OF THE SURFACE SHALL NOT BE LESS THAN THAT OF A CIRCLE OF 3/16" DIAMETER.
(−)
XVI

FIGURE 5. **XVII: Miniature snap fastener terminals.**
XVIII: High-voltage battery sockets.

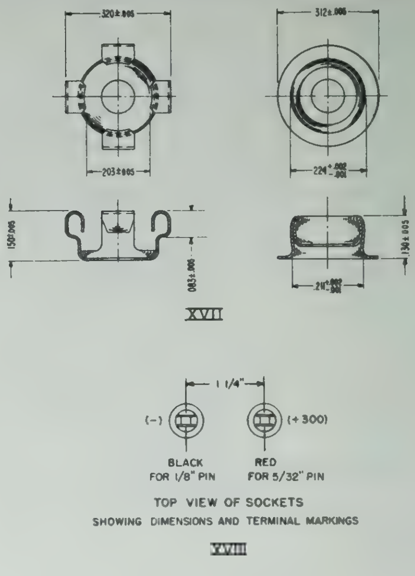
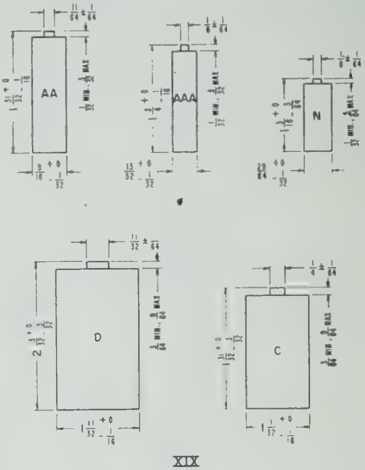


FIGURE 6. Transistor cell dimensions.



WASHINGTON, D.C., May 20, 1959.

U S GOVERNMENT PRINTING OFFICE 1959

GWV:MCK
1.8

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
WASHINGTON 25, D.C.
November 15, 1949

Letter
Circular
LC 965
(Supersedes
LC 877)

Electrical Characteristics of Dry Cells and Batteries (Leclanché Type)

Contents

Page
I. General information.................... 1
II. Standard sizes of cells, dimensions.... and weight.......................... 2
III. Average output on standard tests....... 2
IV. Capacity (approximate) in ampere hours. 7
V. Effect of temperature.................. 10
    1. Voltage......................... 11
    2. Flash or short-circuit current... 13
    3. Internal resistance............. 14
    4. Capacity........................ 15
    5. Storage......................... 16
    6. Freezing........................ 18

I. General Information

The new American Standard Specification for dry cells and batteries, C18-1947, was approved by the American Standards Association (70 East 45th Street, New York 17) on August 6, 1947. This specification was prepared by a committee which included representatives of the industry, large industrial users of batteries and several of the Government departments. It covers a wide variety of sizes and types of dry cells and batteries, including miniature cells recently developed. The new standard specification is printed in Circular No. 466 of the National Bureau of Standards.

Many new uses for dry cells have arisen within the past few years. For these and others still to come, it is advantageous to employ the standard sizes of cells and batteries as given in the specification whenever possible.

The Federal Specification, last issued in February 1948, was revised to conform to the technical requirements of the new American Standard. The new Federal Specification is designated as W-B-101b.

Many inquiries are received at the National Bureau of Standards about operating characteristics of dry batteries. An attempt will be made in this brief summary of available information to answer questions relating to size, output and low-temperature characteristics of the cells. Circular No. 79 entitled, "Electrical Characteristics and Testing of Dry Cells" was last published in 1923 and is now out of print. It is hoped that the present letter circular may be of service to those who use dry batteries.

The data given herein are intended to be illustrative of the behavior of dry batteries. The numerical values given in the tables are based on tests, but these values should not be construed as applying exactly to any particular make or type of cell. Relative performance under varying conditions is more significant than the precise values.

II. Standard Sizes of Cells, Dimensions and Weight

The sizes of cells recognized as standard are listed in table 1, which includes also the approximate volume and weight of the cells. When cells of any particular size are assembled into batteries the weight of the battery will be the aggregate weight of the cells plus the weight of the structural materials exterior to the cells. No definite statement about the latter can be made. The excess weight of the battery over the aggregate weight of the cells is usually in the range of 5 to 15 percent.

All of the cells listed in table 1 are cylindrical in form, but cells of other forms, such as flat cells, may be used in batteries, subject to specified output and dimensions for the particular battery.

III. Average Output on Standard Tests

Dry cells and batteries are subject to tests which should simulate working conditions. The test which best represents any particular service is that which most nearly duplicates the rate of energy output of the battery when in actual use. There is no direct relation between the results of continuous tests and intermittent tests of longer duration.

It is not practicable to include any complete description of the tests in this leaflet. They are familiar to most users of batteries and are available in specifications. Complete information is available in Circular 466. One marked change from former specifications is the fact that all continuous tests have now been discontinued.

Table 1. -- Sizes of Cylindrical Dry Cells

Cell Designation	Nominal Diameter inches	Dimensions Height inches	Approximate Volume cubic inches	Approximate Weight pounds	Principal Uses
AA	17/32	1 7/8	0.42	0.033	Flashlights, radio and miscellaneous
A	5/8	1 7/8	0.57	0.045	Radio B batteries
BF	3/4	1 5/16	0.58	0.046	Flashlights and export
BR	3/4	1 1/2	0.67	0.054	Radio B batteries
B	3/4	2 1/8	0.95	0.077	Radio B and C batteries
C	15/16	1 13/16	1.25	0.10	Flashlights
CL	15/16	2 5/8	1.81	0.14	Hearing aid batteries
CD	1	3 3/16	2.51	0.20	Hearing aid batteries
D	1 1/4	2 1/4	2.76	0.22	Flashlights and Radio B batteries
E	1 1/4	2 7/8	3.52	0.28	Portable telephones
F	1 1/4	3 7/16	4.22	0.35	RR lantern, group. Radio A and heavy duty B batteries
G	1 1/4	4	4.92	0.40	Radio A and heavy duty B batteries
J	1 1/4	5 7/8	7.20	0.60	Group and Radio A batteries
No. 6	2 1/2	6	29.3	2.2	Telephone, ignition and general purpose
Miniature Cells					
R	17/32	1 5/16	-	-	Radio B batteries
P	17/32	1	-	-	Radio B batteries
N	7/16	1 1/16	-	-	Radio and hearing aid B batteries
NS	7/16	3/4	-	-	" " " " " "
U	5/16	1/2	-	-	" " " " " "

The standard temperature for dry-battery tests is 21°C (70°F) unless otherwise stated. Recently there has been increased interest in the performance of all kinds of batteries at low temperatures and a later section of this circular contains the results of various tests on dry batteries at such temperatures.

The output of a given type of battery on standard tests is usually expressed as the time in days, hours or minutes that the battery can maintain a closed-circuit voltage above a specified cut-off voltage which marks the end of the test. Except for B batteries, these cut-off voltages are essentially the same as for tests described in the earlier specifications. The present cut-off voltage for B batteries is given in the new American Standard specification as 15 volts for each section of 22 1/2 volts (nominal voltage), instead of 17 volts formerly specified. Much of the radio equipment now is usable to lower B battery voltages. The Radio Manufacturers Association recognized this tendency to go to lower voltages in its Standard data sheet No. 408B, dated January 22, 1941, specifying 17, 15 and 12 volts as optional cut-off voltages. The proper choice of the end point depends on the characteristics of the apparatus with which the batteries are used.

Another recent change in procedure for testing B batteries is the increased current drain on all but the smallest sizes. The 5000-ohm test, commonly used in the past, is now specified only for the smaller sizes of cells, N, NS and U. The 2500-ohm test is specified for cells of the AA, A, BR, B and D sizes. The 1250-ohm test is also specified for D-size of cells and for the larger cells F and G. Each of these resistances applies to tests of 22 1/2 volt units in the battery. The cut-off voltage, 15 volts, is suited to most needs.

Two new tests for A batteries have been added which were not in Federal Specification W-B-101a. These are the 5-ohm and 25-ohm tests for the many new sizes of A batteries developed in the last few years.

Average results of tests of first-grade batteries, made in 1940, are given in tables 2, 3 and 4. These tables are limited to include only those brands of batteries which fulfilled the requirements of the American Standard Specification C18-1941 or the Federal Specification, W-B-101a. Numbers in parenthesis appearing in some of the tables are the minimum required performance figures of the new American Standard specification. Data given in the tables should be construed to apply to the industry as a whole rather than to any particular make or brand of batteries. In table 5 average results on several brands of B batteries containing smaller cells than those formerly made are given. These batteries were made in 1946. Table 6 shows the average results obtained on several brands of A batteries made in 1946. These two tables are limited to include only those brands which fulfill the requirements of the new American Standard specification C18-1947. In general the quality of batteries produced in 1946 is similar to that in 1940.

Table 2. — Flashlight batteries

Average test results of various brands (1940) which comply with the requirements of ASA specification shown in parenthesis.

Part 1.

Type of battery	Number of brands	Size of Cell	Intermittent test Household test	Continuous tests Initial	after 6 months
			minutes	minutes	minutes
General purpose	8	AA	85 (65)	32(*)	22(*)
" "	14	C	331 (300)	131(*)	118(*)
" "	21	D	723 (600)	459(*)	391(*)

Part 2.

Type of battery	Number of brands	Size of Cell	Intermittent tests Light Ind.	Heavy Ind.	Lantern
			minutes	minutes	hours
Industrial type	9	D	1084(850)	842(750)	—
Railroad lantern type	4	F	—	—	49(45)

---

*Continuous tests are not required by the ASA specification or by the revised Federal Specification.

Table 3. — Radio B batteries

Average test results on various brands (1940) complying with the Federal Specification W-B-101a, to 17 volts.

(Tests made on 22 1/2-volt units)

Type of battery	Number of brands	Size of Cell	Intermittent tests 5000 ohms	1250 ohms	Continuous tests 5000 ohms initial	after 6 months
			hours	hours	hours	hours
Small	6	A	221	-	179	179
Small	13	B	387	-	340	329
Medium	13	D	994	280	1245	1170
Large	11	F	-	505	2335	2179
Large	6	G	-	634	2964	2745

Table 4. -- No. 6 and Group Batteries

Average test results of various brands (1940) complying with requirements of ASA specification, shown in parenthesis.

Type of cell	Number of brands	Size of Cell	Intermittent tests Light days	Intermittent tests Heavy hours	Continuous Tests Initial hours	Continuous Tests after 6 months hours
Industrial	3	No.6	350(275)	123(100)	428(*)	418(*)
General purpose	13	No.6 & group	258(200)	83(70)	296(*)	278(*)
Telephone	4	No.6	273(250)	-	-	-
Special Telephone	11	No.6	360(325)	-	-	-

*Continuous tests are not required by the ASA specification or by the revised Federal Specification.

Table 5. — Radio B batteries (small cells)

Average test results of various brands (1946) complying with requirements of ASA specification, shown in parenthesis.

Type of battery	Number of brands	Size of Cell	2500 ohm Intermittent Test Initial hours	2500 ohm Intermittent Test 6 months hours	5000 ohm Intermittent Test Initial hours	5000 ohm Intermittent Test 6 months hours
Small	5	BR	231(150)	225(130)	-	-
Small	2	AA	100(75)	93(60)	-	-
Miniature	3	N	-	-	111(75)	97(65)
Miniature	2	NS	-	-	43(30)	36(25)
Miniature	1	U	-	-	7(4)	7(3)

Table 6. -- Radio A batteries

Average test results on various brands (1946) complying with requirements of ASA specification, shown in parenthesis.

Number of cells in battery	Size of Cell	Number of Brands	5 ohm test (hours)	25 ohm test (hours)
18 (parallel)	F	5	715(600)	-
8 "	F	5	270(230)	-
4 "	F	4	118(115)	-
3 (series)	G	5	-	195(160)
4 "	F	6	-	162(140)

IV. Capacity (Approximate) in Ampere Hours

Because dry batteries are ordinarily tested on circuits of constant resistance, the results are usually expressed as the time of discharge rather than as the capacity in ampere hours. The ampere hours can be calculated, however, by determining the average value of the current. As a first step the voltage throughout the test should be plotted and the average voltage determined. From this and the known fixed resistance the average current is computed. This in turn is multiplied by the total time of actual discharge.

The voltage characteristics of various makes and brands of dry cells differ and, therefore, the average current delivered by a particular cell can be regarded as only an approximation of the performance of other cells and batteries under comparable conditions.

There are other factors also which affect the ampere-hour capacity of dry batteries. (1) Temperature - see Section V of this circular, (2) The cut-off voltage - the capacity delivered is greater as the cut-off voltage is lower, (3) The relative time of discharge and recuperation — the performance is normally better when the discharge is intermittent, (4) The rate of discharge — the capacity is greater as the discharge current is less, down to a certain point beyond which the service efficiency decreases because the spontaneous reactions within the cells become an increasingly important factor. The point of maximum service efficiency of the cell varies with the make and type of cell and the conditions of its use; that is, whether the drain is continuous or intermittent, whether the temperature is low or high and whether the cut-off voltage is high or low. No very definite statement can be made, but the maximum service efficiency for continuous discharge of a No. 6 cell is obtained on a circuit of 60 to 100 ohms or at a current of 0.01 to 0.02 ampere. For smaller cells this current is proportionately less. In general, other considerations of size, weight, availability, convenience and initial cost outweigh too meticulous attention to conditions of the ultimate service efficiency which can be obtained.

Table 7 gives the ampere-hour capacity of a No. 6 dry cell for various conditions of use. Table 8 gives the approximate capacity of smaller sizes of dry cells when tested under specified conditions of the so-called household intermittent test, that is, 5 minutes discharge once in 24 hours through a resistance of 4 ohms per cell to a cut-off voltage of 0.75 volts per cell. Table 9 gives the approximate ampere-hour and watt-hour capacities of several sizes of cells used in Radio B batteries at various constant current drains from 10 to 150 milliamperes. The cut-off voltage for these is 1.13 volts per cell.

If comparison is made of the discharge of any particular kind of dry cell through a constant resistance circuit with comparable discharge at a fixed current, it is found that the latter is a more severe test. This is because both voltage and current decrease during discharge through the fixed resistance, but when a comparable current is held constant throughout the test, the load on the battery, as it approaches exhaustion, is proportionately more severe.

From time to time attention has been turned to the problem of recharging dry cells*. Although the dry cell is nominally considered a primary battery it may be recharged for a limited number of cycles under certain conditions. Briefly these are:

1. The operating voltage on discharge should not be below 1.0 volt per cell when battery is removed from service for charging.
2. The battery should be placed on charge very soon after removal from service.
3. The ampere-hours of recharge should be 120% - 180% of the discharge.
4. Charging rate should be low enough to distribute recharge over 12-16 hours.
5. Cells must be put into service soon after charging as the recharged cells have poor shelf life.

Recharging of dry cells may be economically feasible only when quantities of dry cells are used under controlled conditions with a system of exchange of used cells for new ones already in practice, and with equipment available to provide direct current for charging. Such a system would not be practical for home use.

*The Effect of Applying a counter EMF to a Leclanché Cell, Kobe and Graham, Trans, Electrochem, Soc., vol. 73, p. 587, 1938.

*Restoring Used Flashlight Cells, Kennedy, Electronics, October 1943; p. 148.

Table 7. -- Relative ampere-hour capacity of a No. 6 cell at various rates of discharge and to various cut-off voltages.

			Capacity	
Current ampere	Cut-off Voltage volts	Discharged 4 hours/day amp-hr	Discharged 8 hours/day amp-hr	Discharged 24 hours/day amp-hr
0.1	0.9	40	36	28
0.1	1.0	37	32	23
0.1	1.1	34	28	21
0.2	0.9	30	24	14
0.2	1.0	29	22	12
0.2	1.1	27	20	11
0.3	0.9	25	13	10
0.3	1.0	23	12	9
0.3	1.1	19	11	8
0.5	0.9	16	9	-
0.5	1.0	15	8	-
0.5	1.1	12	7	-
0.7	0.9	9	-	11*
0.7	1.0	8	-	10*
0.7	1.1	5	-	8*
1.25	0.9	-	7.3*	7.3*
1.25	1.0	-	6.7*	6.7*
1.25	1.1	-	4.7*	4.7*
2.5	0.9	6.0*	4.6*	4.6*
2.5	1.0	3.6*	3.6*	3.6*
2.5	1.1	2.1*	2.1*	2.1*
5.0	0.9	2.3*	2.3*	2.3*
5.0	1.0	1.3*	1.3*	1.3*
5.0	1.1	0.7*	10.7*	0.7*

*These results were obtained on an industrial quality (premium price) No. 6 cell in 1941 and 1946.

Table 8. -- Approximate Capacity of Small Dry Cells
(Intermittent light service, 5 minutes discharge per day
through 4 ohms per cell to 0.75 volt per cell)

Cell Designation	Approximate Capacity ampere-hours
AA	0.4
A	0.6
B	1.1
C	1.5
D	3.4
E	4.3
F	5.2
G	6.1

Table 9. -- Approximate ampere-hour (amp-hr) and watthours (whr)
capacity at various current drains.
(Cut-off voltage 1.13 volts per cell)

Continuous drain	Size A		Size B		Size D		Size F	
ma	amp-hr	whr	amp-hr	whr	amp-hr	whr	amp-hr	whr
10	0.38	0.46	0.70	0.86	3.20	4.00	7.00	8.70
25	0.20	0.25	0.37	0.47	1.50	1.89	3.50	4.40
50	0.14	0.17	0.28	0.35	1.05	1.29	2.00	2.45
100	0.10	0.12	0.18	0.22	0.45	0.55	1.20	1.47
150	0.07	0.09	0.15	0.18	0.33	0.41	0.66	0.79

V. Effect of Temperature

Low temperatures have a marked effect on the output of dry cells. In a paper* published in 1922 it was shown that dry cells become practically inoperative at a temperature of -21°C (-6°F). More recently low temperature cells have been made both experimentally** and commercially***. These cells will operate at a limited capacity down to temperatures of -40°C (-40°F). The cells will perform best on light current drains where the effect of internal resistance is not so marked.

*Electromotive force of cells at low temperatures, by G. W. Vinal and F. W. Altrup, Sci. Papers, BS 17, 627 (1922), No. 434.

**Low Temperature Dry Cells, by E. Otto, C. K. Morehouse, G. W. Vinal. Trans. Electrochem. Soc. Vol. 90, 1946. (p. 419)

***Dry Cell Designed to operate at -40°F; Containing Lithium Chloride in Electrolyte, by M. E. Wilke, Trans. Electrochem. Soc. vol. 90, 1946. (p. 433)

The effect of low temperatures on standard types of dry cells will be discussed from the standpoint of voltage, flash current, internal resistance, capacity, storage and freezing.

1. Voltage

The electromotive force of a dry cell, that is, the true open-circui voltage, decreases about 0.02 volt when the temperature is decreased from 25°C (77°F) to -20°C (-40°F). That is, the decrease averages 0.0004 volt per degree Centigrade. This is slightly more than for a lead storage battery. However, the open-circuit voltage is usually measured by a voltmeter which draws a small current from the cell and the effect of temperature on the emf may appear to be greater in proportion as the IR drop in voltage within the cell itself is greater. Using a voltmeter having a resistance of 300 ohms, the error in measuring emf at -20°C (-4°F) is from 2 to 3 percent depending on the size of the cell. Below -20°C this error becomes much larger. The electromotive force of one brand of No. 6 dry cells at various temperatures is given in table 10.

Table 10. — Electromotive force of a No. 6 dry cell at temperatures between +25° and -20°C.

Temperature		Electromotive Force	Temperature		Electromotive Force
°C	°F	volts	°C	°F	volts
+25	+77	1.577	0	+32	1.566
+20	+68	1.574	-5	+23	1.564
+15	+59	1.572	-10	+14	1.561
+10	+50	1.570	-15	+5	1.558
+5	+41	1.568	-20	-4	1.556

For practical purposes the actual working voltage at the terminals of the cell or battery under specified conditions of load and temperature is of more significance than the emf. Table 11 shows the results of measurements on a cell of size F under such conditions. The values for open-circuit voltage given in this table happen to be higher than those reported for the emf of another cell in table 10. The difference is attributable to inherent differences in materials and construction of the two cells. It is apparent therefore, that in applying any of these data to a particular cell the relative changes produced by temerature or current drain are more important than actual voltages. Calculations should be based on the measured open-circuit voltage of the particular cell at normal temperature. In table 12 closed-circuit voltages are shown for a No. 6 cell under various conditions of load and temperature. Data given in tables 11 and 12 do not apply directly to other sizes of cells, but a rough approximation may be made by assuming the severity of the load to be inversely proportional to the ratio of the volumes (see table 1).

Table 11. -- Inital voltages of a dry cell, size F, under varying conditions of temperature and current drain

Temperature °C	°F	open circuit	Terminal voltage at indicated drains .020 amp.	.050 amp.	.075 amp.	.10 amp.	.14 amp.
30	86	1.645	1.641	1.632	1.621	1.612	1.605
25	77	1.644	1.639	1.628	1.617	1.607	1.599
20	68	1.643	1.637	1.624	1.613	1.603	1.591
10	50	1.641	1.634	1.620	1.605	1.592	1.579
0	32	1.640	1.631	1.614	1.595	1.581	1.568
-10	14	1.639	1.627	1.605	1.584	1.564	1.537
-20	-4	1.630	1.61	1.59	1.56	1.54	1.52
-25	-13	1.622	1.60	1.57	1.54	1.51	1.49
-30	-22	1.610	1.49	1.28	1.10	0.96	0.86

Table 12. -- Initial voltages of a dry cell, size No. 6 under varying conditions of temperature and current drain (obtained in 1942).

Temperature °C	°F	open circuit	Terminal voltage at indicated drains .50 amp.	1.0 amp.	2.0 amp.	5.0 amp.	10.0 amp.
21	70	1.59	1.55	1.52	1.47	1.33	1.12
0	32	1.58	1.52	1.48	1.41	1.21	0.88
-10	14	1.57	1.49	1.44	1.35	1.08	0.65
-20	-4	1.56	1.45	1.37	1.23	0.81	0.15

2. Flash or short-circuit current

Low temperatures produce a much greater effect on the flash or short-circuit current than on the electromotive force. Short-circuit current is defined as the maximum current, observed on a dead-beat ammeter, which the cell or battery can deliver through a circuit of 0.01 ohm resistance, including the ammeter. Such a measurement is useful as a test of uniformity or to show whether the cells can meet some specified condition requiring large flash current, but it gives no reliable indication of the capacity or quality of the cells for other purposes.

Table 13 gives the average results of measurements of the short-circuit current, as defined above. The figures apply to No. 6 cells and to cells of the D size. Here again the proportional changes produced by temperature variations are of more significance than the actual readings. The table shows that the percentage change for cells differing in volume by a ratio of 10 to 1 is essentially the same at corresponding temperatures above 0°C (32°F). Below this temperature the smaller cell is more seriously affected. If the flash currents of other sizes of cells are known at specified temperatures, an approximation of their performance at other temperatures may be made on the basis of this table.

Table 13. — Flash (short circuit) currents of dry cells

(average of several brands)

Temperature °C	Temperature °F	No. 6 Cells Flash Current amp.	No. 6 Cells Percentage of current at 25°C	Size D Cells Flash Current amp.	Size D Cells Percentage of current at 25°C
40	104	35.3	112	7.7	117
30	86	33.2	105	7.0	106
25	77	31.6	100	6.6	100
20	68	29.7	94	6.1	92
10	50	25.7	81	5.2	79
0	32	21.6	68	4.2	64
-10	14	17.6	55	3.1	47
-20	-4	10.0	32	1.0	15
-30	-22	1.0	3	0.1	1.5
-40	-40	0.1	0.3	0.0	0.0
-50	-58	0.0	0	-	-

3. Internal Resistance

Decreased flash current at low temperatures is the result of increased resistance of the cells. The internal resistance of a battery varies somewhat with the rate of current discharged. For the present purpose it is defined in terms of the flash current. The formula is $R = \frac{E}{I} - 0.01$ where R is the resistance of the cell in ohms, E its electromotive force in volts at a specified temperature, I the flash current in amperes and 0.01 ohm the resistance of the external measuring circuit. Table 14 gives the average result of measurements on twelve No. 6 cells of six different brands. At -30°C and below the measurements were limited to one of these brands. This table gives similar data also for cells of the D size. It may be noted that the percentage change in resistance is practically independent of the size of the cells at temperatures of 0°C and above. With the average values of internal resistance of various sizes of cells given in table 15 a fair approximation of the average internal resistance of various sizes at specified temperatures may be obtained.

Table 14. — Internal resistance of dry cells

(Flash current method, average of several brands)

Temperature		No. 6 Cells		Size D Cells	
°C	°F	average resistance ohms	percentage of R at 25°C	average resistance ohms	percentage of R at 25°C
40	104	0.033	87	0.195	86
35	95	.034	89	.202	89
30	86	.036	95	.214	94
25	77	.038	100	.227	100
20	68	.041	108	.246	108
15	59	.045	118	.264	116
10	50	.049	129	.291	128
5	41	.055	145	.322	142
0	32	.061	161	.362	159
-5	23	.068	179	.424	187
-10	14	.077	203	.493	217
-15	5	.095	250	.733	323
-20	-4	.144	379	1.551	684
-30	-22	1.5	4000	15.6	6900
-40	-40	15.0	40000	—	—

Table 15. — Approximate Internal Resistance of Dry Cells

(Average of several brands at 25°C, calculated from flash currents)

Size of Cell	Average Flash Current	Internal Resistance of single cell
	amperes	ohms
AA	4.6	0.311
C	5.4	.284
D	6.6	.227
F	8.8	.173
No. 6	32.0	.038

When apparatus is designed to operate momentarily on a relatively large current, the internal resistance of the cells becomes important. If the internal resistance of a single cell is too high to provide the current, either two or more cells must be connected in parallel or a larger size of cell selected. Connecting additional cells in series will not accomplish the desired result. Since the internal resistance increases at decreased temperature, calculations should always be based upon the lowest temperature likely to be attained by the battery. This is not necessarily the lowest temperature to which the battery is exposed. The battery does not take the temperature of its surroundings immediately and thermal insulation is helpful.

4. Capacity

The capacity of dry cells is usually expressed as the output of the cells, measured in some unit of time, on some specified test (see Sections III and IV). The effect of temperature on the output may be expressed as a ratio or percentage based on the normal output. Thus in table 16, the relative capacity at various temperatures of a 22 1/2-volt battery unit containing F cells is given on the basis of the 1250-ohm test to a cut-off voltage of 15 volts. Actually the capacity for any particular size of cell will vary with the following factors (a) the load, (b) the temperature, (c) the cut-off voltage. Table 16 shows the variation with temperature alone, assuming the specified conditions of the test which define the load and the cut-off voltage. The effect of temperature on the capacity of dry cells is analogous to its effect on other types of batteries.

Table 16. -- Effect of temperature on the capacity of dry cells
(Tests on a 22 1/2-volt battery unit of F cells discharging through 1250 ohms to a cut-off voltage of 15 volts)

Temperature		Capacity (based on value at 70°F taken as 100 percent)
°C	°F	percent
38	100	140
27	80	115
21	70	100
16	60	90
4	40	69
-7	20	48
-18	0	27
-29	-20	6

5. Storage

The temperature of dry cells and batteries has considerable effect on their shelf life, that is on the length of time they can be stored without serviceability decreasing more than a specified amount. Delayed service tests are made after a specified period of storage at 21°C (70°F). The decrease in service capacity allowed by the specification varies with the type of battery and the test to which it is subjected. For example, after 6 months, an industrial type of cell of the No. 6 size on the heavy intermittent test is expected to give 90% of the initial requirement. Cells designed for light intermittent drains should normally have better shelf life characteristics than those intended for heavy service. The difference is largely the result of using materials which are the best suited to differing service conditions. The smallest cells deteriorate on the shelf more rapidly than the larger sizes. Specifications for B batteries allow a deterioration of 11 percent in service capacity in 6 months for batteries containing F cells, and 20 percent in the same period for the much smaller cells of size AA. Shelf deterioration should in no case be excessive. In this respect cells of the present day are superior to those made 20 or more years ago.

Shelf tests are distinguished from delayed service tests by the fact that the shelf tests are continued until the open-circuit voltage falls below a specified value, no discharge being made. Such tests apply particularly to radio C batteries, but there are other applications requiring such tests. Table 17 gives the average results of 60 batteries of 20 different brands. While 2 of these batteries lasted 8 years on this test, the table shows that only half of the batteries completed 2 years and only a third of the batteries lasted 3 years. These batteries were stored at 20°C (70°F).

When dry cells are stored for future use, the temperature of the batteries should not be above normal room temperature. Lower temperatures are beneficial because spontaneous reactions occurring within the cells are retarded and evaporation of moisture is less. Table 18 gives the average results on a large number of No. 6 cells stored at several temperatures, including temperatures above and below normal room temperature. Although the difference between the highest, 40°C, and the lowest, 9°C, is not very great, the effect on the batteries is remarkable. Those which were stored at 9°C were in better condition at the end of 5 years than the others at 40°C after one year. Another factor in storage is packaging. Various types of packaging such as paraffining, metal-foil wrapping and plastic envelopes have been used in an attempt to keep evaporation of moisture to a minimum. Proper packaging seems to increase materially the battery shelf life at higher temperatures.*

*Service Life of and Gases Evolved from Dry Batteries Stored at 130°F, by W. J. Hamer, J. P. Schrodt, G. W. Vinal, Trans. Electrochem. Soc. vol. 90, p. 449, 1946.

Table 17. -- Shelf life of "C" batteries
Batteries contained D size cells, 1 1/4 by 2 1/4 inches. They were stored at 70°F (21°C)

Time	Number of brands	Number of batteries*	Average OCV per battery volts	Average OCV per cell volts
Initial	20	60	4.73	1.576
1 year	20	57	4.58	1.526
2 years	13	33	4.52	1.506
3 "	11	21	4.50	1.500
4 "	3	8	4.55	1.516
5 years	2	5	4.54	1.513
6 "	2	4	4.46	1.486
7 "	1	2	4.47	1.490
8 "	1	2	4.42	1.473

* Batteries were discarded from the test when the open-circuit voltage fell to 4.35 volts (1.45 volts per cell). The table gives the average of all batteries remaining on test at the end of each period of time.

Table 18. — Effect of temperature on deterioration of No. 6 dry cells in storage.
(Average values of open-circuit voltage in volts and percentage of initial values for the flash currents*)

	+40°C (+104°F)		+20 to 25°C (+68 to 77°F)		+9°C(+48°F)	
Time years	open-circuit voltage volts	flash current percent	open-circuit voltage volts	flash current percent	open-circuit voltage volts	flash current percent
0	1.58	100	1.58	100	1.58	100
1	1.43	28	1.54	83	1.57	91
2	1.27	5	1.51	59	1.55	76
3	-	-	1.49	33	1.54	58
4	-	-	1.48	22	1.53	44
5	-	-	1.46	12	1.52	31
6	-	-	1.28	-	1.48	19

*The flash currents were measured in accordance with the method specified above for the short-circuit currents. The actual values in amperes initially ranged from 24 to 34 amperes as several types of cells are included in the average. All measurements were made at 20 to 25°C.

6. Freezing

The question often arises whether or not freezing is injurious to dry cells. The freezing point is about -21°C (-6°F) for the standard Leclanché cell. Various tests have shown that dry cells which have been frozen are usable after they have been thawed out and brought to a reasonable operating temperature. Care must be taken to avoid condensation of moisture ("Sweating") on the cells as this will destroy jackets and increase electrical leakage. Table 19 shows test results on two batteries which were left in Little America, Antartica for 7 1/2 years. When found the batteries were at a temperature of 0°F and had been lower. The results shown in table 19 not only indicate that freezing is not harmful but also indicate the benefits of low temperature storage.

Table 19. -- Comparison of results obtained on two batteries stored in Little America for 7 1/2 years with results obtained shortly after manufacture on batteries of the same brand made in the same year.

	New Battery in 1939 (hours)	Battery from Little America (7 1/2 years old) (hours)
Heavy Intermittent Test	66	70
Railroad Lantern Test	42	34

UN

UNION
CARBID

Form R-186

UNION CARBIDE CONSUMER PRODUCTS COMPANY SALES OFFICES

Atlanta, Ga.	1371 Peachtree Street, N.E.
Chicago, Ill.	230 North Michigan Avenue
Dallas, Tex.	1511 Bryan Street
Kansas City, Mo.	910 Baltimore Avenue, P.O. Box 888
Los Angeles, Calif.	2770 Leonis Boulevard
New York, N.Y.	270 Park Avenue
Pittsburgh, Pa.	The Oliver Building, Mellon Square
San Francisco, Calif.	22 Battery Street

"Eveready", Cat with "Nine Lives", "Ignitor", "Layerbilt", "Mini-Max", and "Union Carbide" are registered trade-marks for products of

UNION CARBIDE CONSUMER PRODUCTS COMPANY
DIVISION OF UNION CARBIDE CORPORATION
270 Park Avenue, New York 17, N. Y.

IN CANADA: Union Carbide Canada Limited, Toronto

Form R-1867

Litho in U.S.A.

UNION
CARBIDE